10/510408 DT04 Rec'd PCT/PTO 0 5 OCT 2004

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Ala Gly Asp Leu Leu Val Leu Ala Lys Thr Thr Val Arg Asn Tyr Ala 85 90 95	
Ile Ala Ile Thr Glu Thr Ala Thr Pro Glu Leu Arg Arg Val Leu Val	
Lys Gln Ile Asn Ala Ala Ile Lys Leu His Glu Gln Val Phe Tyr Phe 115 120 125	
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gtt ccc ggc atg ctc ttg acc ggt tca gca aag acg cct gtc gca gtg Val Pro Gly Met Leu Leu Thr Gly Ser Ala Lys Thr Pro Val Ala Val 35 40 45	323
tca tac aga ggg gcc cac acc cgc aaa ctg acg aaa aaa tcc tat ttc Ser Tyr Arg Gly Ala His Thr Arg Lys Leu Thr Lys Lys Ser Tyr Phe	371

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					tct Ser 85											467
					gtc Val											515
					aaa Lys											563
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					gat Asp											659
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					gac Asp											755
	_		_	_	ata Ile		_		_			-			-	803
_					ctg Leu											851
					cat His											899
					att Ile 245											947
				_	gaa Glu	_						_				995
		_	_		gca Ala		_				_					1043
caa	tac	ttt	aat	tta	atg	aaa	aat	gtc	ttg	cac	cgc	caa	ttt	aca	atc	1091

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Tyr Arg Gly Ala His Thr Arg Lys Leu Thr Lys Lys Ser Tyr Phe Ile 50 55 60

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Tyr Phe Asn Leu Met Lys Asn Val Leu His Arg Gln Phe Thr Ile Ser 295 Arg Leu Ser Arg Tyr Ala Val Asn Trp His Glu Thr Ile Ala Pro Phe 305 310 Leu Glu His Asp Pro Tyr Thr Thr Val Thr Tyr Ser Arg Leu Glu Asp 325 330 Glu Gln Lys Gln Ile Phe His Phe Ile Asp Gln Arg Lys Arg Phe Leu 350 340 Leu Phe Glu Leu Ser Arg 355 <210> 13 <211> 1570 <212> DNA <213> Bacillus licheniformis <220> <221> CDS (501)..(1067) <222> <400> 13 accaaagtca aatcgtatcg cccgtttcac agcgcctttg atccgtgtcc gccgatcggc 60 aaaagatact acagaacccc tccaaatcta tatctaggtt ttcagccccg cggccttccg 120 caqttttccc cqatqqaqqc qctqcaaaaa qqqacqcttt qqcccqtatt ttacqatcat 180 tatgaaaatc cgtatgaaga tgggaggtaa ggagggtgac gaactcttta ccgcaagact 240 attataaaaq qcttcatgaa attcaggctg ttgattttgt catcgttgag ctgatgctat 300 accttgacac acatcccgat gataccgatg ccatcaaaca atacaaccag tatgccggat 360 tttccagaaa actgaaagcg aagtttgaat caaaatacgg ccctttgatt caaggaagcc 420 cggatcagac ggaatcctat tggagctgga aaagaagtcc ttggccatgg caagtttaat 480 agaggaaggg agtcaggttc atg tgg ctt tat gag aaa aaa ctg cag tat cct 533 Met Trp Leu Tyr Glu Lys Lys Leu Gln Tyr Pro gtt agg gtg aga gaa tgc aat ccg aga ctt gcc aaa ttt ttg att gag 581 Val Arg Val Arg Glu Cys Asn Pro Arg Leu Ala Lys Phe Leu Ile Glu 15

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Gln Tyr Gly Gly Ala Asp Gly Glu Leu Ala Ala Ala Leu Arg Tyr Leu 30 . 35 40	
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Phe Ala His Leu Glu Met Ile Ala Thr Met Val Tyr Lys Leu Thr Lys 65 70 75 80

Asp Ala Thr Pro Glu Gln Met Lys Glu Ala Gly Leu Gly Asp His Tyr 85 90 95

Ala Asp His Asp Lys Ala Leu Phe Tyr His Asn Ala Ala Gly Val Pro 100 105 110

Phe Thr Ala Thr Tyr Ile Gln Ala Lys Gly Asp Pro Ile Ala Asp Leu 115 120 125

Tyr Glu Asp Ile Ala Ala Glu Glu Lys Ala Arg Ala Thr Tyr Gln Trp 130 135 140

Leu Ile Asp Met Ser Asp Asp Pro Asp Leu Asn Asp Gly Leu Ala Phe 145 150 155 160

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                                                                      360
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                                           Met Glu Thr Arg Pro Tyr
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Ser Trp Ile Ala Leu Asp Pro Glu Cys Glu His Pro Gly Asn Asp Tyr
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cac cct agt tat cct aag aaa aaa tta tgt gac gac tat act tgc aac
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His Pro Ser Tyr Pro Lys Lys Leu Cys Asp Asp Tyr Thr Cys Asn
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Cys Gly Arg Lys Gly Gln Asn Gly Phe Ile Asp Ser Asp Leu Asp Gln
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ctt cat ctt aac aaa cag ctc tca gat gaa acg atc atc att aaa gac
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Leu His Leu Asn Lys Gln Leu Ser Asp Glu Thr Ile Ile Ile Lys Asp
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                                                                      776
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Ser Cys Asp Val Gln Val Ser Thr Glu Asp Thr Gln Thr Leu Ala Ser
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Val Met Thr Ala Ala Gln Thr Leu Ala Val Thr Ile Ile Leu Ala Ile
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atc gat gat cct gat cta gcc gaa ctt gtc aca act gat ctg ttg cag
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Thr Ile Ile Leu Ala Ile Ile Asp Asp Pro Asp Leu Ala Glu Leu Val 100 105 110 Thr Thr Asp Leu Leu Gln Val Thr Ala Asn Lys Gln Thr Asn Arg Gln 115 Lys Leu Val Ile Asp Asn Ser Arg Asn Val His Val Thr Thr Glu Asp 135 Thr Asp Thr Ala Ile Ile Val Ser Thr Phe Val Gln Thr Val Val Ile 150 155 Thr Ile Thr Ala Leu Ile Val Gly Leu Leu 165 <210> 17 <211> 1516 <212> DNA <213> Bacillus licheniformis <220> <221> CDS <222> (501)..(1013) acgtcggtca cgccggggac cctaatatgg cacacggcaa agaagatgac tgcgggtgcg 60 ggccgggcca attcccggga ggttttccag gtgcggcgcc atatggacag atgccgcaaa 120 tqqqaqctcc qtacqqtatq qqqqqatacq qacaqcaqcc tqcaqqqqqa cagatgttta 180 acagaccgga agatgatgaa gactgattcg gaatgggacg atgatctatc gttccttttt 240 tattgtggac cgctataaac attttcatgc tatttaacgg gaatgtctat aactgtcaag 300 ggtaactctt cgcatcccgc acatcctaaa aaagagcgca atgctcaaat tcagcggttt 360 tcacgggggg tactaccatt ggacagcaag ctgaaagtgt tttcgggggat tttgcttttg 420 acagcaggtc tatctgcatg cggaacgaac gacgctatag ataatggaaa caatacgcgc 480 ccgatcggat attatctcaa atg atg cag atc gta atg cag ggt ctt gat aat 533 Met Met Gln Ile Val Met Gln Gly Leu Asp Asn 1 gac ggc cct gtt aca gaa atg ctt gaa aac atg aac ggg aga cac ggt 581 Asp Gly Pro Val Thr Glu Met Leu Glu Asn Met Asn Gly Arg His Gly 15 25 629 gca aca aac gta aac aat cga gcg gga aac ggc aat ccc gtt cca aca

Ala Thr Asn Val Asn Asn Arg Ala Gly Asn Gly Asn Pro Val Pro Thr

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			oct cag aac att agg Pro Gln Asn Ile Arg 155	965
	r Thr Asn Asn		egc ttg egg aac caa Arg Leu Arg Asn Gln 170	1013
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Ser Arg Gly Asp Met Asn Tyr His Asn His Leu Val Asn Thr Ala Asp 50 55 60

Thr Gly Tyr Asp Arg Pro Glu Asn Arg Lys Ile Ser Arg Asn Ile Thr 65 70 75 80

Gly Arg Val Asn Lys Leu Asn Tyr Val Asp Glu Ser Gln Ala Val Val 85 90 95

Thr Asn Glu Thr Val Ile Ile Ala Val Arg Ser Asp Lys Arg Leu Thr 100 105 110

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Lys Gln Tyr Leu Glu Asn Val Ile Ser Asn Met Gly Ile Gln Ala Gln 65 70 75 80

Val Thr Ala Glu Glu Ger Lys Arg Val Val Phe Gln Leu Lys Gly
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Asp Lys Thr Ala Leu Leu Ile Gly Lys Arg Gly Gln Thr Leu Asn Ala 100 105 110

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Glu Ile Ile Glu Ala Gly Ile Val Lys Thr Val His Asp Glu Val Val

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Gly	Ile	Val 35	Lys	Thr	Val	His	Asp 40	Glu	Val	Val	Glu	Thr 45	Phe	Ser	Ser
Tyr	Ile 50	Lys	Pro	Lys	Lys	Phe 55	Pro	Lys	Leu	Thr	Arg 60	Arg	Cys	Lys	Asn
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Ile	Ile	Thr	Trp 100	Gly	Asn	Met	Asp	Met 105	Lys	Val	Leu	Lys	Gln 110	Asn	Cys
Met	Phe	Asn 115	His	Val	Pro	Phe	Pro 120	Phe	Lys	Gly	Glu	Met 125	Arg	Asp	Leu
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Lys	Ala	Leu	Asp	Asp 165	Ala	Met	Thr	Thr	Tyr 170	Lys	Leu	Phe	Arg	Leu 175	Val

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90 85 80 821 ctg ttt ttg att ata ttt gtc gcg ttt gac ttg gtt tac ttg cgc ttt Leu Phe Leu Ile Ile Phe Val Ala Phe Asp Leu Val Tyr Leu Arg Phe 100 869 ctq ttt ttt qaa aaa gat gga ggc tcc atc att ccg tac att tgg ctg Leu Phe Phe Glu Lys Asp Gly Gly Ser Ile Ile Pro Tyr Ile Trp Leu 115 ccg ctc ttt att ttg gcg gta ggc att gcg gcc gct tat gca aag caa 917 Pro Leu Phe Ile Leu Ala Val Gly Ile Ala Ala Ala Tyr Ala Lys Gln 125 130 aaa caq tcc tct aaa aaa acg ttc gtt tcc gca tta ttt cta atg ttt 965 Lys Gln Ser Ser Lys Lys Thr Phe Val Ser Ala Leu Phe Leu Met Phe 155 145 140 1013 gtt ttt act gtg atg gag tgg ttc ccg gcg tta agg gtc aat gaa gag Val Phe Thr Val Met Glu Trp Phe Pro Ala Leu Arg Val Asn Glu Glu gac tgg ctc tat tta atg ctg ctt cct tta tta gcc tgc aac gct ttt 1061 Asp Trp Leu Tyr Leu Met Leu Leu Pro Leu Leu Ala Cys Asn Ala Phe cag ctt tta atg ctg cca aaa ttt cag gca cgc gct tagaccggct 1107 Gln Leu Leu Met Leu Pro Lys Phe Gln Ala Arg Ala 190 gctactttac ttctgaagat tttgcatccg tatttgcgat taattcgctg actgttacgt 1167 ttttgagccc cttgcttctg agatggtgca cgatctctgg cagggcttct tttgtttgtt 1227 tggcggaatc tgaagcgtga aagagcacga tgtcaccggc gtttaccgtt ccatttacgt 1287 1347 tttggacgat cttttgaacc cccqqqttcg tccagtcatc cgagttaata ctataatgaa caacggtgta gccgtactgt ttagcaacat cgagtacgtc tttattaaac tggccggtcg 1407 1467 gcggtcttaa aagcgtaagg tcgtcaagcc cgagtttttg aaaggagtgt cgtgcttttg 1527 ctaaqtcttt tttqatctcq cttttcttca tttgcgaata gtttttataa gcatagccca tactcccgat ctggtgacca tctttacgga ttctttctac gacatccggg tggcgctctg 1587

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Met Gly Phe Val Ile Phe Leu Thr Ile His Arg Phe Ala Leu Glu Ile 65 70 75 80

Phe Arg Ser His Ser Leu Trp Asn Ser Ile Gln Leu Phe Leu Ile Ile 85 90 95

Phe Val Ala Phe Asp Leu Val Tyr Leu Arg Phe Leu Phe Phe Glu Lys
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Asp Gly Gly Ser Ile Ile Pro Tyr Ile Trp Leu Pro Leu Phe Ile Leu 115 120 125

Ala Val Gly Ile Ala Ala Ala Tyr Ala Lys Gln Lys Gln Ser Ser Lys 130 135 140

Lys Thr Phe Val Ser Ala Leu Phe Leu Met Phe Val Phe Thr Val Met 145 150 155 160

Glu Trp Phe Pro Ala Leu Arg Val Asn Glu Glu Asp Trp Leu Tyr Leu 165 170 175

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				gca gac gag Ala Asp Glu 170		1010
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				atc aaa ggc Ile Lys Gly		1106
			n Glu Arg	ttt ttc gcg Phe Phe Ala 220		1154
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Leu Arg Phe Gln Lys Pro Ala Leu Ile Ala Val Thr Gly Ala Asp Phe 65 70 75 80

Ser Leu Met Val Asn Asp Glu Glu Val Pro Leu Trp Arg Pro Val Phe 85 90 95

Ile Lys Glu Gly Ser Val Leu Thr Phe Gly Met Cys Lys Arg Gly Ser

Arg Ala Tyr Met Ala Val Ala Gly Gly Ile Asp Val Pro Pro Val Met 115 120 125

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Arg Ala Leu Gln Lys Gly Asp Val Leu Ser Leu Gly Ser Pro Thr Pro 145 150 155 160

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					cct Pro 305											1445
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Pro 145	Gly	Lys	Glu	Arg	Tyr 150	Ile	Val	Leu	Glu	Leu 155	Lys	Val	Leu	Ala	Asp 160
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Ala Glu Glu Asn Leu Lys Ala Phe Lys Glu Lys Leu Thr Asp Asp Tyr 300 290 295 Pro Val Phe Pro Ile Ser Ala Val Thr Arg Gln Gly Leu Arg Asp Leu Leu Phe Glu Ile Ala Asp Arg Leu Glu Thr Thr Pro Glu Phe Pro Leu Tyr Asp Glu Glu Asp Met Ala Glu Asn Arg Val Met Tyr Lys Leu Glu 345 340 Asp Glu Glu Ala Pro Phe Glu Ile Ser Arg Asp Pro Asp Gly Thr Phe 360 355 Val Leu Ser Gly Ala Lys Leu Glu Arg Leu Phe Lys Met Thr Asp Phe 380 375 370 Ser Arg Asp Glu Ser Val Lys Arg Phe Ala Arg Gln Leu Arg Gly Met 400 395 390 385 Gly Val Asp Asp Ala Leu Arg Ala Arg Gly Ala Lys Asp Gly Asp Thr 415 410 Ile Arg Leu Leu Glu Phe Glu Phe Glu Phe Ile Asp 420 <210> 31 <211> 2115 <212> DNA <213> Bacillus licheniformis <220> <221> CDS (501)..(1616) <222> <400> 31 attectegta aaaggegegg ategegtege egeettttee etttaaagea teatcaagtg 60 atgtgatgcc ctcaacagcc tttttgactt tggcgatttc gtctgattgt tgttttaatt 120 180 qttccaqcqt ttqatctatt qcattgtgca gcgcctgaac atcaagagtc ttcatggcat tctcctctaa tccttttcat tacaatcagt atatagttta ccactttata gaaagtactt 240 ggtgaatata tcctgttcaa ccatgaaaat gaatcattgg gcttaggtca ttatttctat 300

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aaa ata aac cgc tgg tac aac gaa att caa aaa tta aac gta ata gaa Lys Ile Asn Arg Trp Tyr Asn Glu Ile Gln Lys Leu Asn Val Ile Glu 15 20 25	581
gca gaa cga tta aag gcg gaa gtt cac tta gct ata gaa aga atg gaa Ala Glu Arg Leu Lys Ala Glu Val His Leu Ala Ile Glu Arg Met Glu 30 35 40	629
gaa gat cag gac ttg ctt tcc tat tat cag ctt atg aat ttt aga cat Glu Asp Gln Asp Leu Leu Ser Tyr Tyr Gln Leu Met Asn Phe Arg His 45 50 55	677
gag tta atg ttg gaa tat ctt ttc ccg gca gaa aaa aag ctg agc aaa Glu Leu Met Leu Glu Tyr Leu Phe Pro Ala Glu Lys Lys Leu Ser Lys 60 65 70 75	725
tct gat tat ctt agg gaa att gag gga cag gga aga aaa ttg tca ggc Ser Asp Tyr Leu Arg Glu Ile Glu Gly Gln Gly Arg Lys Leu Ser Gly 80 85 90	773
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cgc gga aaa tac ata aag gca atc aag gca tat aga gca gca gaa aaa Arg Gly Lys Tyr Ile Lys Ala Ile Lys Ala Tyr Arg Ala Ala Glu Lys 110 115 120	869
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gtg att cga aga att aat tgt cta ttc gtt gtt gct ggg aat tac att Val Ile Arg Arg Ile Asn Cys Leu Phe Val Val Ala Gly Asn Tyr Ile 175 180 185	1061
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tta aat gta gca tat tgt tat aat gca atg gag aga cca aca aaa gct Leu Asn Val Ala Tyr Cys Tyr Asn Ala Met Glu Arg Pro Thr Lys Ala 220 225 230 235	1205
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aat aac gaa aat att gaa gga cga aaa ttt tat gaa aag gcg ctt gaa Asn Asn Glu Asn Ile Glu Gly Arg Lys Phe Tyr Glu Lys Ala Leu Glu 270 275 280	1349
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ctg gca tta gaa gca gct cta ttc tat act agg aat gag cgg cca aat Leu Ala Leu Glu Ala Ala Leu Phe Tyr Thr Arg Asn Glu Arg Pro Asn 335 340 345	1541
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<212> PRT

<213> Bacillus licheniformis

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Ala Glu Val His Leu Ala Ile Glu Arg Met Glu Glu Asp Gln Asp Leu 35 40 45

Leu Ser Tyr Tyr Gln Leu Met Asn Phe Arg His Glu Leu Met Leu Glu 50 55 60

Tyr Leu Phe Pro Ala Glu Lys Lys Leu Ser Lys Ser Asp Tyr Leu Arg
65 70 75 80

Glu Ile Glu Gly Gln Gly Arg Lys Leu Ser Gly Leu Leu Glu Tyr Tyr 85 90 95

Phe Ser Phe Phe Thr Gly Met Tyr His Phe Ser Arg Gly Lys Tyr Ile 100 105 110

Lys Ala Ile Lys Ala Tyr Arg Ala Ala Glu Lys Lys Leu Thr Lys Val 115 120 125

Ser Asp Lys Ile Glu Lys Ala Glu Phe Tyr Tyr Lys Met Ala Glu Val 130 135 140

Phe Tyr His Met Lys Gln Thr His Met Ser Met Tyr Tyr Val Ser Leu 145 150 155 160

Ala Tyr Asp Ile Tyr Lys Ser Tyr Asp Ala Tyr Val Ile Arg Arg Ile 165 170 175

Asn Cys Leu Phe Val Val Ala Gly Asn Tyr Ile Asp Leu Ser Thr His

180 185 190

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- Ile Gln Asn Lys Ala Ile Val Ala Lys Ala Leu Leu Asn Val Ala Tyr 210 215 220
- Cys Tyr Asn Ala Met Glu Arg Pro Thr Lys Ala Ile Glu Tyr Phe His 225 230 235 240
- Lys Ala Ile Asp Val Ala Lys Glu Ile Lys Ala Lys Glu Leu Thr Gln 245 250 255
- Ala Tyr Tyr Asp Leu Ala Leu Ile His Phe Arg Asn Asn Glu Asn Ile 260 265 270
- Glu Gly Arg Lys Phe Tyr Glu Lys Ala Leu Glu Ser Ala Arg Val Phe 275 280 285
- Glu Asp Glu Leu Phe Leu Cys Leu Leu Asp Val Leu Glu Ala Leu Phe 290 295 300
- Ile Lys Ser Ala Asn Lys Ser Glu Val Leu Glu Thr Met Lys Pro Leu 305 310 315 320
- Arg Asp Ser Arg Gly Tyr Pro Tyr Leu Glu Glu Leu Ala Leu Glu Ala 325 330 335
- Ala Leu Phe Tyr Thr Arg Asn Glu Arg Pro Asn Asp Ser Ile Phe Phe 340 345 350
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cqa gac att tca ggt tca atc gaa atg aaa gat gac ata gat aaa gca
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Arg Asp Ile Ser Gly Ser Ile Glu Met Lys Asp Asp Ile Asp Lys Ala
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Ile Glu Lys Met Glu Glu Asp His Asp Val Leu Leu Tyr Tyr Gln Met
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                            35
                                                                      677
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Leu Asp Phe Arg Leu Arg Leu Leu Leu Glu Asp Ile Ser Gln Ser Ser
aca gaa aaa ttg gaa gcc atc agt ttt aag gac aaa gat cca aaa agt
                                                                      725
Thr Glu Lys Leu Glu Ala Ile Ser Phe Lys Asp Lys Asp Pro Lys Ser
acg gac gat aag ctg aat tat tat ttt tat ctg ttc aaa ggg att tat
                                                                      773
Thr Asp Asp Lys Leu Asn Tyr Tyr Phe Tyr Leu Phe Lys Gly Ile Tyr
                                                                      821
qaa qac tac aaq caa aac cat aca gaa gcg ctt aat ttt ttc aga ata
Glu Asp Tyr Lys Gln Asn His Thr Glu Ala Leu Asn Phe Phe Arg Ile
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                                100
gcg gaa aaa agg ctg agc gtc att caa aat gaa att gaa aaa gcc gaa
                                                                      869
Ala Glu Lys Arg Leu Ser Val Ile Gln Asn Glu Ile Glu Lys Ala Glu
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                                                                      917
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Phe His Tyr Lys Ile Gly Val Leu Tyr Tyr Asn Leu Lys Ala Thr Trp
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	tat Tyr															1061
	gca Ala															1109
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	gaa Glu															1205
gaa Glu	acg Thr	aaa Lys	gcc Ala	aag Lys 240	tat Tyr	gct Ala	tac Tyr	ctt Leu	cta Leu 245	tgt Cys	gta Val	tat Tyr	gaa Glu	aac Asn 250	aca Thr	1253
agg Arg	tct Ser	ctt Leu	ttc Phe 255	aaa Lys	acc Thr	aac Asn	gat Asp	ccc Pro 260	gac Asp	caa Gln	gct Ala	ttt Phe	aaa Lys 265	tgg Trp	atc Ile	1301
gac Asp	aca Thr	ggc Gly 270	ttt Phe	aaa Lys	aaa Lys	gct Ala	caa Gln 275	gaa Glu	gtg Val	aat Asn	agc Ser	gaa Glu 280	att Ile	ttc Phe	gaa Glu	1349
	aaa Lys 285															1397
ctg Leu 300	gaa Glu	gta Val	atc Ile	aag Lys	gac Asp 305	ttt Phe	att Ile	cac His	caa Gln	tta Leu 310	gaa Glu	gat Asp	aaa Lys	aaa Lys	gca Ala 315	1445
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	gca Ala										tag	gatg	aaa i	aaagt	gttgt	1594
tag	ctgt	att 1	tgta	ttag	gc a	ctgti	tttca	a gci	tttt	cgtt	tgc	aaat	cac q	gctc	ctgaag	1654

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<212> PRT

<213> Bacillus licheniformis

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Arg Leu Leu Glu Asp Ile Ser Gln Ser Ser Thr Glu Lys Leu Glu 50 55 60

Ala Ile Ser Phe Lys Asp Lys Asp Pro Lys Ser Thr Asp Asp Lys Leu 65 70 75 80

Asn Tyr Tyr Phe Tyr Leu Phe Lys Gly Ile Tyr Glu Asp Tyr Lys Gln 85 90 95

Asn His Thr Glu Ala Leu Asn Phe Phe Arg Ile Ala Glu Lys Arg Leu 100 105 110

Ser Val Ile Gln Asn Glu Ile Glu Lys Ala Glu Phe His Tyr Lys Ile 115 120 125 Gly Val Leu Tyr Tyr Asn Leu Lys Ala Thr Trp Leu Ser Ile His His Ile Asn Ile Ala Ser Gly Ile Phe Gln Gly Tyr Asp Gly Tyr Ala Lys Arg Val Ile Asn Cys Lys Met Leu Ile Gly Leu Asn Tyr Ile Asp Gln Phe Lys Phe Ala Glu Ser Glu Val Leu Leu Lys Glu Ala Ile Glu Lys Thr Glu Lys Ile Gly Asp Gln Tyr Leu Leu Pro Tyr Thr Tyr Tyr Asn Met Gly Phe Leu Lys Ser Lys Glu Asp Lys His Glu Glu Ala Leu Lys Tyr Tyr Asn Lys Ala Phe Ala Ile Lys Asp Phe Glu Thr Lys Ala Lys Tyr Ala Tyr Leu Leu Cys Val Tyr Glu Asn Thr Arg Ser Leu Phe Lys Thr Asn Asp Pro Asp Gln Ala Phe Lys Trp Ile Asp Thr Gly Phe Lys Lys Ala Gln Glu Val Asn Ser Glu Ile Phe Glu Leu Lys Phe Lys Thr Leu Tyr Thr Leu His Ser Asp Cys Gln Asn Lys Leu Glu Val Ile Lys Asp Phe Ile His Gln Leu Glu Asp Lys Lys Ala Trp Val Asp Leu Glu Glu Leu Leu Met Asp Val Ala Asn Tyr Tyr Arg Glu Asn Lys Leu Tyr Glu Glu Ala Ile Tyr Phe Tyr Ile Lys Thr Asp Lys Ala Ser Lys Leu

Ala Gly Arg Gly Gly Glu

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ggaa	aag	tgc t	cccg	9999	ca ga	cato	cctgt	t tat	cacao	ccga	tggt	tgat	tt d	gato	cgcgt	180
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taca	agt	tcg t	atto	catat	t to	gaaga	aagta	a gt	gtata	aaaa	gcad	ccctt	tc a	agcaa	agggtg	300
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togg	jaag.	aaa g	ggago	eteca											cc aac la Asn)	533
		aat Asn														581
		cga Arg 30														629
		caa Gln														677
		atg Met														725
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		ctg Leu														821

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cat His																917
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gcg Ala																1013
tcc Ser																1061
aca Thr																1109
gcc Ala																1157
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gct Ala																1301
cgc Arg																1349
gcg Ala																1397
gca Ala 300																1445
atc Ile																1493

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<211> 366

<212> PRT

<213> Bacillus licheniformis

<400> 36

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Leu Ile Tyr Tyr Ser Leu Leu Glu Leu Arg His Lys Ile Met Leu Tyr 50 55 60

Asp Thr Arg Gly Lys Lys Ile Glu Gln Glu Glu Leu Thr Asn Gly 65 70 75 80

Gly Ser Ala Ala Ser His Met Thr Ser Tyr Tyr Tyr Tyr Leu Phe Ser

85 90 95

Gly Ala Tyr Glu Val Tyr Lys Lys Asn Tyr Glu Gln Ala Ile Ser Phe 100 105 110

Tyr Lys Ile Ala Glu Lys Lys Leu Ala His Val His Asp Glu Ile Glu 115 120 125

Val Ala Gln Phe His Asp Lys Val Gly Lys Leu Tyr Tyr Tyr Leu Gly 130 135 140

Gln Asn Ile Val Ser Leu Asn His Thr Arg Gln Ala Met Glu Ile Phe 145 150 155 160

Lys Gly His Gly Asp His Asp Met Asn Leu Val Ser Thr Tyr Ile Thr 165 170 175

Met Ala Gly Asn Tyr Thr Glu Met Gly Lys Tyr Thr Glu Ala Glu Glu 180 185 190

Tyr Leu Thr Glu Ala Ile His Thr Val Arg Lys Ala Gly Asp Cys Phe 195 200 205

Lys Glu Met Gln Leu Leu His Asn Phe Ala Leu Leu Tyr Ala Ala Met 210 215 220

Asp Asn Ser Glu Lys Ser Ile Gln Phe Leu Glu Ile Val Leu Asp Asp 225 230 235 240

Gln Ala Tyr Ala Ala Ser Asp Tyr Tyr Phe Asn Ala Val Phe Leu Met 245 250 255

Ile Lys Glu Leu Phe Lys Val Gly Asp His Lys Arg Ala Ala Phe 260 265 270

Tyr Lys Glu Gly Lys Glu Arg Ser Lys Ser Ala Ala Asn Lys Ile Phe 275 280 285

Asp Ala Lys Ile Asp Ile Leu Tyr Ala Ala Tyr Ala Gly Asp Gly Glu 290 295 300

Gln Ala Val Lys Asp Cys Lys Asp Asn Ile Glu Ile Leu Phe Gln Thr 305 310 315 320

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725

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Pro Gly Glu Gly His Leu Gln Lys Tyr Arg Asn Ala Lys Ser Thr Leu 50 55 60

Val Ile Gly Val Arg Lys Thr Leu Lys Phe Asp Ser Ser Lys Pro Ser

Ala Glu Tyr Ala Ile Pro Phe Ala Thr Gly Cys Met Gly His Cys His 85 90 95

65

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Tyr Val Asn Val Glu Glu Ile Leu Glu Gln Ala Asp Gln Tyr Ile Lys 115 120 125

Glu Arg Ala Pro Glu Asp Thr Arg Phe Glu Ala Ser Cys Thr Ser Asp 130 135 140

Ile Val Gly Ile Asp His Leu Thr His Thr Leu Lys Arg Ala Ile Glu 145 150 155 160

His Phe Gly Gln Thr Asp His Gly Lys Leu Arg Phe Val Thr Lys Phe 165 170 175

His His Val Asp His Leu Leu Asp Ala Lys His Asn Gly Lys Thr Arg 180 185 190

Phe Arg Phe Ser Val Asn Ala Glu Tyr Val Ile Lys Ser Phe Glu Pro 195 200 205

Gly Thr Ser Pro Leu Asp Lys Arg Ile Glu Ala Ala Val Lys Val Ala 210 215 220

Glu Ala Gly Tyr Pro Leu Gly Phe Ile Ile Ala Pro Ile Tyr Ile His 225 230 235 240

Asp Gly Trp Gln Glu Gly Tyr Arg Val Leu Leu Glu Lys Leu Asp Arg 245 250 255

Ala Leu Pro Gln His Ala Arg Arg Asp Ile Thr Phe Glu Met Ile Gln 260 265 270

His Arg Phe Thr Lys Pro Ala Lys Arg Val Ile Glu Lys Asn Tyr Pro 275 280 285

Lys Thr Lys Leu Glu Leu Asp Glu Glu Lys Arg Arg Tyr Lys Trp Gly 290 295 300

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55

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Glu Lys Phe Ser Arg Leu Cys Arg Pro Phe Ile Ser Lys Leu Phe Pro 65 70 75 80	
Glu Ile Pro Pro Asp His Pro Ala Met Gly Tyr Ile Leu Ser Asn Leu 85 90 95	-
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ctt g Leu G																821
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Glu Ser Lys Leu 65	Ser Asn Leu 70	Arg Ile Pro	Arg Ala Ala Tyr 75	Glu Leu 80
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Leu Ile Arg Lys 115	Leu Phe Gly	Ile Phe Asp 120	Asp Ala Val Leu 125	Lys Gly
Ser Asp Asn His	Leu Thr Ile	Thr Leu Gln	Thr Asp Gly Pro	Asp Asp

130 135 140

Arg Leu Val Ile Phe Leu Asp Phe His Gly Val Phe Thr Lys Leu Thr 145 150 155 160

Gly Ile Lys Asp Phe His His Ser Leu Ala Asp Phe Tyr Glu Ile Lys 165 170 175

Arg Phe Asp Val Thr Asp Arg Glu Cys Ile Ala Glu Ile His Ile Lys 180 185 190

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<212> PRT

<213> Bacillus licheniformis

<400> 45

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Pro Ala Gly Gly Asp Gly Gly Lys Gly Gly Asp Val Val Phe Lys Val 35 40 45

Asp Glu Gly Leu Ser Thr Leu Met Asp Phe Arg Tyr Gln Arg His Phe 50 55 60

Lys Ala Ala Arg Gly Glu His Gly Met Ser Lys Asn Gln His Gly Arg 65 70 75 80

Asn Ala Glu Asp Met Val Val Lys Val Pro Pro Gly Thr Val Val Ile 85 90 95

Asp Asp Asp Thr Lys Gln Val Ile Ala Asp Leu Thr Glu His Gly Gln 100 105 110

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	aaa Lys 125																917
	ctg Leu																965
	cgg Arg																1013
	acg Thr																1061
_	aaa Lys	_			_		_		_	_	_				ttg Leu	•	1109
	gtc Val 205																1157
	cgt Arg																1205
	cgg Arg															٠	1253
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	gac Asp																1346
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gtc	cgcaa	agc a	acati	tgc	ca to	gctca	atgad	aag	gatt	gagc	ctt	gtatt	ttt 9	gcag	gacaa	.a	1526
ata	ctcca	ata a	aaac	cgct	ga ca	attga	acaat	tc	egtta	aata	tgca	acgt	ggc (cgact	ttccg	g	1586
caa	actt	ttc 1	tgaad	egeet	g c	tacag	ggctt	caa	aaggo	ccct	ttg	ccgat	ttt 9	ggaa	agacc	C	1646

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- <211> 282
- <212> PRT
- <213> Bacillus licheniformis
- <400> 47

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Asp Leu Ser Glu Glu Thr Val Glu Glu Ile Lys Leu Gln Asp Leu Arg
20 25 30

Pro Asn Pro Tyr Gln Pro Arg Lys Thr Phe Asp Asp Gln Ser Leu Lys

Asp Leu Lys Glu Ser Ile Leu Gln His Gly Val Leu Gln Pro Ile Ile 50 55 60

Val Arg Lys Ser Ile Lys Gly Tyr Asp Ile Val Ala Gly Glu Arg Arg 65 70 75 80

Phe Arg Ala Ala Glu Lys Ala Gly Leu Glu Thr Ile Pro Ala Ile Val 85 90 95

Arg Glu Leu Ser Glu Ser Leu Met Met Glu Ile Ala Leu Leu Glu Asn 100 105 110

Leu Gln Arg Glu Asp Leu Ser Pro Leu Glu Glu Ala Lys Ala Tyr Glu 115 120 125

Ser Leu Leu Lys His Leu Asp Met Thr Gln Glu Gln Leu Ala Lys Arg 130 135 140

Leu Gly Lys Ser Arg Pro His Ile Ala Asn His Leu Arg Leu Leu Thr 145 150 155 160

Leu Pro Glu Asp Val Gln Lys Leu Ile Asp Asn Gly Thr Leu Ser Met

165 170 175

Gly	His	Gly	Arg 180	Thr	Leu	Leu	Gly	Leu 185	Lys	Asn	Lys	Lys	Lys 190	Leu	Glu		
Pro	Leu	Val 195	Gln	Lys	Val	Val	Ser 200	Glu	Gln	Leu	Asn	Val 205	Arg	Gln	Leu		
Glu	Lys 210	Leu	Ile	Gln	Gln	Leu 215	Asn	Ala	Asp	Val	Pro 220	Arg	Glu	Thr	Lys		
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Leu	Arg	Asn	Tyr	Phe 245	Gly	Thr	Pro	Val	Thr 250	Ile	Lys	Lys	Gln	Lys 255	Lys		
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480

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acg aag ctt atg a Thr Lys Leu Met M 30				
ctg atc tat atg g Leu Ile Tyr Met V 45				
tca gag gtc att c Ser Glu Val Ile F 60				
atc aaa aaa gat a Ile Lys Lys Asp I 8				
gct ctg agc ata t Ala Leu Ser Ile S 95				
ttt gca ttt gcg a Phe Ala Phe Ala I 110				
cgt gtc aga acg c Arg Val Arg Thr I 125				
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gca Ala	agc Ser	atc Ile	ggc Gly	tgt Cys 240	aca Thr	gtc Val	gly ggg	gtt Val	gtg Val 245	acc Thr	Gly aaa	ctg Leu	att Ile	ctc Leu 250	agc Ser	12	253
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tcg Ser 300	gct Ala	gaa Glu	tta Leu	gtg Val	ccg Pro 305	acg Thr	ctt Leu	tat Tyr	gaa Glu	tct Ser 310	ctg Leu	att Ile	gca Ala	atc Ile	ggc Gly 315	14	145
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gac Asp 380	gat Asp	gaa Glu	gga Gly	aaa Lys	gaa Glu 385	aaa Lys	gag Glu	atc Ile	gat Asp	ctg Leu 390	ttt Phe	ttg Leu	agc Ser	acg Thr	gtg Val 395	10	685
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acg Thr	gaa Glu	gaa Glu 430	aag Lys	caa Gln	tat Tyr	ttt Phe	aaa Lys 435	aac Asn	cgc Arg	aag Lys	ctg Leu	aaa Lys 440	aag Lys	gag Glu	ttt Phe	1	829
cat	cag	cac	tgc	tcc	aaa	tca	aag	caa	gta	gaa	gcg	ctg	att	gaa	gac	1	877

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					gtt Val											1973
					cgg Arg											2021
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					ata Ile											2117
					tat Tyr 545											2165
					tcc Ser											2213
					ggc Gly											2261
					tac Tyr											2309
					gtc Val											2357
					gcc Ala 625											2405
					gaa Glu											2453-
					atc Ile											2501
					agg Arg											2549

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<213> Bacillus licheniformis

<400> 49

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Gln His Leu Tyr Ser Leu Phe Phe Tyr Lys Gly Leu Ile Tyr Met Val 35 40 45

Ile Gly Phe Leu Leu Gly Arg Ala Phe Ile Leu Ser Glu Val Ile Pro 50 55 60

Phe Ala Leu Pro Phe Phe Gly Ala Met Leu Leu Ile Lys Lys Asp Lys 65 70 75 80

Ala Phe Leu Ala Cys Leu Ala Leu Leu Ala Gly Ala Leu Ser Ile Ser 85 90 95

Pro Gln His Ser Leu Phe Val Leu Ala Ala Leu Phe Ala Phe Ala Ile 100 105 110

Cys Ser Lys Met Thr Ser Leu Ile Ile Lys Asp Arg Val Arg Thr Leu 115 120 125

Pro Val Val Val Phe Leu Ala Met Ala Val Thr Arg Cys Gly Phe Val 130 135 140

Tyr Ala Glu Tyr Gly Thr Val Ser Gly Tyr His Tyr Ile Met Ala Phe 145 150 155 160

Val Glu Ala Gly Leu Ser Phe Ile Leu Thr Leu Ile Phe Leu Gln Ser 165 170 175

Leu Pro Ile Val Thr Ser Lys Arg Ala Lys Gln Ser Leu Lys Ile Glu 180 185 190 Glu Ile Ile Cys Phe Met Ile Leu Ile Ala Ser Val Leu Thr Gly Leu Thr Gly Val Ser Phe Gln Gly Met Gln Ala Glu Leu Ile Leu Ala Arg Tyr Val Val Leu Ala Phe Ala Phe Ile Gly Gly Ala Ser Ile Gly Cys Thr Val Gly Val Val Thr Gly Leu Ile Leu Ser Leu Ser Asn Ile Gly Asn Leu Tyr Gln Met Ser Leu Leu Ala Phe Ser Gly Leu Leu Gly Gly Leu Leu Lys Glu Gly Lys Lys Phe Gly Ala Ala Val Gly Leu Leu Ile Gly Ser Leu Leu Ile Ser Leu Tyr Gly Glu Gly Ser Ala Glu Leu Val Pro Thr Leu Tyr Glu Ser Leu Ile Ala Ile Gly Leu Phe Leu Leu Thr Pro Gln Ser Ile Thr Lys Lys Val Ala Lys Tyr Ile Pro Gly Thr Thr Glu His Ala Gln Glu Gln Gln Tyr Ala Arg Lys Ile Arg Asp Val Thr Ala Gln Lys Val Asp Gln Phe Ser Asn Val Phe His Ala Leu Ser Glu Ser Phe Ala Thr Phe Tyr His Ser Ala Pro Asp Asp Glu Gly Lys Glu Lys Glu Ile Asp Leu Phe Leu Ser Thr Val Thr Glu His Ser Cys Gln Ser Cys Tyr Lys Lys Asn Lys Cys Trp Val Gln Asn Phe Asp Lys

Thr Tyr Asp Leu Met Lys Arg Val Met Gln Glu Thr Glu Glu Lys Gln

420 425 430

Tyr	Phe	Lys	Asn	Arg	Lys	Leu	Lys	Lys	Glu	Phe	His	Gln	His	Cys	Ser
-		435					440					445			

- Lys Ser Lys Gln Val Glu Ala Leu Ile Glu Asp Glu Leu Thr His Phe 450 455 460
- Arg Ala Asn Gln Thr Leu Lys Gln Lys Val His Asp Ser Arg Arg Leu 465 470 475 480
- Val Ala Glu Gln Leu Leu Gly Val Ser Gln Val Met Ala Asp Phe Ser 485 490 495
- Arg Glu Ile Lys Arg Glu Arg Glu Gln His Phe Ile Gln Glu Gln 500 505 510
- Ile Arg Asp Ala Leu Gln His Phe Gly Ile Glu Ile Gln Gln Val Glu 515 520 525
- Ile Tyr Ser Leu Glu Gln Gly Asn Ile Asp Ile Glu Met Ser Ile Pro 530 540
- Tyr Cys Asn Gly His Gly Glu Cys Glu Lys Ile Ile Ala Pro Met Leu 545 550 555 560
- Ser Asp Ile Leu Glu Glu Gln Ile Ile Val Lys Ala Glu Gln Cys Ala 565 570 575
- Gly His Pro Asn Gly Tyr Cys His Val Ala Phe Gly Ser Ala Lys Ser 580 585 590
- Tyr Arg Val Val Thr Gly Ala Ala His Ala Ala Lys Gly Gly Leu
 595 600 605
- Val Ser Gly Asp Ser Tyr Asn Met Met Glu Leu Gly Thr Gly Lys Tyr 610 615 620
- Ala Ala Ile Ser Asp Gly Met Gly Asn Gly Ala Arg Ala His Phe 625 630 635 640
- Glu Ser Asn Glu Thr Ile Lys Leu Leu Glu Lys Ile Leu Gln Ser Gly 645 650 655

Ile Asp Glu Lys Val Ala Ile Lys Thr Ile Asn Ser Ile Leu Ser Leu 660 665 670

Arg Thr Thr Asp Glu Ile Tyr Ser Thr Leu Asp Leu Ser Val Ile Asp 675 680 685

Leu Gln Asp Ala Ser Cys Lys Phe Leu Lys Ile Gly Ser Thr Pro Ser 690 695 700

Phe Ile Lys Arg Gly Asp Gln Ile Ile Lys Val Gln Ala Ser Asn Leu 705 710 715 720

Pro Ile Gly Ile Ile Thr Glu Phe Asp Val Asp Val Val Ser Glu Gln 725 730 735

Leu Lys Ala Gly Asp Leu Leu Ile Met Met Ser Asp Gly Ile Phe Glu 740 745 750

Gly Pro Arg His Val Glu Asn His Asp Leu Trp Met Lys Arg Lys Leu 755 760 765

Lys Ser Leu Lys Thr Glu Glu Pro Gln Glu Ile Ala Asp Leu Ile Met 770 775 780

Glu Glu Val Ile Arg Thr Arg Ser Gly Leu Ile Glu Asp Asp Met Thr 785 790 795 800

Val Ile Val Ile Lys Leu Asp His Asn Thr Pro Lys Trp Ala Ser Ile 805 810 815

Pro Ala Pro Ala Phe Phe Gln Lys Asn Gln Glu Ile Ser 820 825

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<212> DNA

<213> Bacillus licheniformis

<220>

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<212> PRT

<213> Bacillus licheniformis

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Phe Met Phe Thr Pro Phe Ser Pro Tyr Val Leu His Pro Ala Gly Lys 50 55 60

Leu Ser Phe Ser Val Val Ile Val Leu Val Ala Phe Gly Phe Lys Arg
65 70 75 80

Phe Arg Phe Phe Leu Gln Asn Leu Phe Ser Phe Tyr Phe Ala Thr Phe 85 90 95

Leu Met Gly Gly Gly Ile Ile Gly Ala His Ser Leu Leu Glu Thr Asp 100 105 110

Ser Ile Met Glu Asn Gly Val Phe Met Thr Asn Trp Ser Gly Phe Gly
115 120 125

Asp Pro Val Ser Trp Leu Phe Val Cys Val Gly Phe Ala Ala Val Trp 130 135 140

Leu Phe Ser Lys Lys Arg Phe Glu Asp Ala Glu Ala Lys Lys Ile Gln 145 150 155 160

Tyr Glu Glu Arg Val Arg Leu Glu Ala Cys Ile Gly Glu His Thr Leu 165 170 175

His Phe Thr Gly Leu Ile Asp Ser Gly Asn Gln Leu Tyr Asp Pro Ile 180 185 190

Thr Lys Thr Pro Val Met Ile Val Asn Ile Glu Lys Leu Lys Val Val

Leu Gly Glu Glu Ala Ser Val Thr Ile Lys Glu Met Ser Pro Leu Asp 210 215 220	
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Leu Lys Pro Asp His Val Leu Val Cys Thr Glu Arg Glu Val Ile Glu 260 265 270	
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			ctg gaa ctg gtg Leu Glu Leu Val 40	
			acg cct gaa gad Thr Pro Glu Asp 55	
ctt ctt tta aac Leu Leu Leu Asn 60	aga ttg gga Arg Leu Gly 65	aat tac agc Asn Tyr Ser	atg tat aca ctg Met Tyr Thr Leu 70	gaa gag 725 Glu Glu 75
			ggc gga cac cgc Gly Gly His Arg	
			gcc gtc aaa gga Ala Val Lys Gly 105	lle Arg
gaa ata tca tca Glu Ile Ser Ser 110	ttt aat att Phe Asn Ile	cgc att gcc Arg Ile Ala 115	aaa gaa aaa ato Lys Glu Lys Ile 120	ggc att 869 Gly Ile
		Leu Phe Gln	aac tcg tgg ctg Asn Ser Trp Leu 135	
			aca aca ctg ctc Thr Thr Leu Leu 150	
			aac gcc cct gcc Asn Ala Pro Ala	
	Asp Glu Arg		gca ggc tgt gta Ala Gly Cys Val 185	. Asn Gly
			gac atc ctt gac Asp Ile Leu Asp 200	
		Met Met Ile	aga tcg atg agt Arg Ser Met Ser 215	

gta atg atc gcc gat gag atc ggg aga atg gaa gac gca gaa gcg ctc Val Met Ile Ala Asp Glu Ile Gly Arg Met Glu Asp Ala Glu Ala Leu 220 225 230 235	1205
ttg gaa gcg gtc cac gcg ggg gtg act gtc atc gtt tcg gct cac ggc Leu Glu Ala Val His Ala Gly Val Thr Val Ile Val Ser Ala His Gly 240 245 250	1253
tac aca tat gca gat ctc gcc agg cgt cca tca ttg aaa atg ctt caa Tyr Thr Tyr Ala Asp Leu Ala Arg Arg Pro Ser Leu Lys Met Leu Gln 255 260 265	1301
gag cac cgg gtt ttt gag cga atc gtg gaa ctt tcc aga aag aac ggt Glu His Arg Val Phe Glu Arg Ile Val Glu Leu Ser Arg Lys Asn Gly 270 275 280	1349
ccc ggc agc ctg agc cgc atc cta aat ggg aac gga gag ccg ctc ggg Pro Gly Ser Leu Ser Arg Ile Leu Asn Gly Asn Gly Glu Pro Leu Gly 285 290 295	1397
gca gca aag agg atg tta tca tgc tgaagctttt aggtgccgtg cttattttgg Ala Ala Lys Arg Met Leu Ser Cys 300 305	1451
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<213> Bacillus licheniformis

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Leu Pro Tyr Val Ala Thr Pro Glu Asp Ser Ala Leu Leu Leu Asn Arg 50 55 60

45

40

35

Leu Gly Asn Tyr Ser Met Tyr Thr Leu Glu Glu Glu Leu Lys Lys Gly 65 70 75 80

Tyr Val Thr Ile Arg Gly Gly His Arg Val Gly Leu Ala Gly Arg Val 85 90 95

Val Val Glu Asn Gly Ala Val Lys Gly Ile Arg Glu Ile Ser Ser Phe 100 105 110

Asn Ile Arg Ile Ala Lys Glu Lys Ile Gly Ile Ser Lys Pro Tyr Val 115 120 125

Pro His Leu Phe Gln Asn Ser Trp Leu Asn Thr Leu Ile Ile Gly Pro 130 135 140

Pro Gln Thr Gly Lys Thr Thr Leu Leu Arg Asp Leu Ala Arg Leu Ile 145 150 155 160

Ser Ser Gly Ser Gly Asn Ala Pro Ala Lys Lys Val Gly Ile Val Asp 165 170 175

Glu Arg Ser Glu Ile Ala Gly Cys Val Asn Gly Ile Pro Gln Tyr Arg 180 185 190

Leu Gly Asp Arg Ala Asp Ile Leu Asp Ala Cys Pro Lys Ala Glu Gly
195 200 205

Leu Met Met Met Ile Arg Ser Met Ser Pro Glu Val Met Ile Ala Asp 210 215 220

Glu Ile Gly Arg Met Glu Asp Ala Glu Ala Leu Leu Glu Ala Val His 225 230 235 240

Ala Gly Val Thr Val Ile Val Ser Ala His Gly Tyr Thr Tyr Ala Asp 245 250 255

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Glu Arg Ile Val Glu Leu Ser Arg Lys Asn Gly Pro Gly Ser Leu Ser

280

275

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gct ga Ala Gl 45	lu Ile														674
atc go Ile Al 60															722
gca ga Ala Gl															770
gac ag Asp Se															818
tac ga Tyr Gl		Leu													866
att to Ile Se															914
gag ga Glu Gl 140	aa gct lu Ala	gaa Glu	gca Ala	aat Asn 145	ctc Leu	gcc Ala	cag Gln	gcg Ala	aaa Lys 150	aat Asn	gaa Glu	aaa Lys	atg Met	gtc Val 155	962
aaa ag Lys Se															1010
taatga	aagag	ggga	gcata	ac ac	cgaa					gta Val					1062
caa at Gln Il	tt gco le Ala	ggc Gly	gtc Val 185	ggg Gly	atc Ile	gtc Val	gtc Val	gct Ala 190	ttt Phe	ctt Leu	cac His	acc Thr	ata Ile 195	ctg Leu	1110
gat ca Asp Gl															1158
ttc at		Ile													1206
caa aa Gln Ly 23										tag	gggg	gct (cact	Ile 240	1257
gaa at	tc gtt	. caa	atc	gta	gga	ctg	gga	atg	atc	gcc	acc	ttc	ctc	agc	1305

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Met Leu Lys Leu Leu Gly Ala Val Leu Ile Leu Ala Ala Ala Thr Trp 10 Thr Gly Phe Glu Met Ala Lys Pro Phe Arg Glu Arg Pro Lys Gln Ile 25 30 Arg Gln Leu Leu Ala Ala Leu Gln Ser Leu Glu Ala Glu Ile Met Tyr	
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Met Leu Lys Leu Leu Gly Ala Val Leu Ile Leu Ala Ala Ala Thr Trp 1 Thr Gly Phe Glu Met Ala Lys Pro Phe Arg Glu Arg Pro Lys Gln Ile 25 Arg Gln Leu Leu Ala Ala Leu Gln Ser Leu Glu Ala Glu Ile Met Tyr 45 Gly His Thr Pro Leu Arg Gln Ala Ser Lys Gln Ile Ala His Gln Leu Glu Fo Glu Pro Val Ala Ser Leu Phe Gln Thr Phe Ala Glu Gln Leu Glu Glu Glu Glu Glu Glu Glu Glu Glu Gl	

Gln Phe Gly Glu Thr Leu Gly Arg His Asp Leu Ile Ser Gln Gln Lys 115 120 125

His Ile Lys Leu Ala Leu Thr His Leu Glu Thr Glu Glu Ala Glu Ala 130 135 140

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<212> PRT

<213> Bacillus licheniformis

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Tyr Ala Gln Trp Val Thr Leu Leu Gly Phe Ile Tyr Ile Leu Phe Met 35 40 45

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Leu Phe Gln Gly

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20 25 30

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30 35 40

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														gcg Ala		965
														cag Gln 170		1013
_		_			_	_								ctg Leu		1061
														gtc Val		1109
														gtg Val		1157
														atg Met		1205
														gcg Ala 250		1253
														atc Ile		1301
														cgg Arg		1349
														atg Met		1397
														aaa Lys		1445
														gcc Ala 330		1493
														gcc Ala		1541
gcg	gtt	ctc	cag	cct	ctc	gga	ggc	ggc	ccg	gtt	atc	agc	tgc	ctg	gat	1589

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aaat	cacaa	agc o	ctcac	caaca	aa go	catat	atct	tag	gaaca	igat	ggct	gtto	aa t	tgga	aaaga	2033
acgo	cagag	ggg (caggt	ttac	ca aç	gcgad	caaat	aca	agat	aga	ccga	gtcg	gag g	gtcto	cttctg	2093
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Glu	Thr	Ala 35	Ala	Glu	Glu	Ser	Ala 40	Glu	Ala	Ile	Ala	Arg 45	Glu	Gln	Ala	
Glu	Gly 50	Leu	Glu	Leu	Asp	Arg 55	Val	Gly	Glu	Phe	Trp 60	Asn	Asn	Ile	Leu	
Thr 65	Glu	Tyr	Gly	Gly	His 70	Leu	Pro	Glu	Ser	Gln 75	Lys	Gly	Ser	Leu	Leu 80	

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	Ile 145	Val	Tyr	Met	Val	Leu 150	Ile	Ile	Leu	Ala	Leu 155	Asn	Ser	Phe	Arg	Val 160
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]	Leu	Ser	Leu	Val 180	Pro	Leu	Leu	Leu	Ala 185	Leu	Met	Ala	Thr	Ser 190	Gly	Gly
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		210				Ile	215	-				220				
:	225					Ile 230					235					240
					245	Leu				250					255	
	-			260		Phe			265					270		
			275			Gly		280					285			`
		290				Val	295					300				
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315 320 305 310 Gly Val Ala Ile Leu Ile Cys Ile Ala Ala Phe Pro Ala Ile Lys Ile 330 325 Leu Ser Leu Ala Leu Ile Tyr Lys Ile Ala Ala Ala Val Leu Gln Pro 340 345 Leu Gly Gly Gly Pro Val Ile Ser Cys Leu Asp Val Ile Ser Lys Ser 355 360 Val Ile Tyr Ile Phe Ala Ala Met Ala Ile Val Ser Leu Met Phe Phe 370 Leu Ser Leu Thr Val Ile Ile Thr Ala Gly Asn Leu Thr Met Met 395 390 Lys <210> 62 <211> 1696 <212> DNA <213> Bacillus licheniformis <220> <221> CDS (501)..(1193) <222> <400> cttgatcgtt gtaatactga acccgatctt ctctttattc aggacagatc cggatgtgat 60 ttttgagaag cttacaaaaa acggacaagt tcagtcaaac gaaataaaaa atcagctgaa 120 180 ttcaqaaaaa aaaqaaatac aaqcctcaca acaagcatat atcttagaac agatggctgt tcaattggaa aagaacgcag agggcaggtt tacaagcgac aaatacaaga tagaccgagt 240 cgaggtctct tctgacagcc agctgaaaac agagaaagac ctcagtaagc atgcggaagt 300 ctcggtattc ttgaaaccag catcggaaaa aacggtccaa gccgtcgctc ctgtcgagat 360 caatacggac cggagctacc agtccatgca ggaaagagaa aagaaagaga cgggggaagt 420 cagagaacag ctagcaggca tctgggaaat aagccccgac aagattacag ttcatatcga 480 agggggagaa cgaagcggca atg aat aaa aga acc tgg atc gaa aag ctg atc 533 Met Asn Lys Arg Thr Trp Ile Glu Lys Leu Ile

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gtc Val	agc Ser 45	cag Gln	atc Ile	ttc Phe	tct Ser	tcc Ser 50	gaa Glu	cct Pro	tcc Ser	caa Gln	gag Glu 55	cca Pro	gcg Ala	gca Ala	gat Asp	677
cag Gln 60	ccg Pro	gcg Ala	gct Ala	tca Ser	caa Gln 65	aaa Lys	gct Ala	acg Thr	tct Ser	gaa Glu 70	agc Ser	acc Thr	gta Val	cag Gln	agc Ser 75	725
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											aag Lys					1061
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Ser Ser Glu Pro Ser Gln Glu Pro Ala Ala Asp Gln Pro Ala Ala Ser 50 55 60

Gln Lys Ala Thr Ser Glu Ser Thr Val Gln Ser Gly Glu Gly Glu Lys 70 75 80

Glu Val Phe Lys Pro Ala Ser Asp Asp Lys Pro Lys Glu Ser Ile Gln 85 90 95

Asp Tyr Glu Gln Glu Tyr Glu Asn Gln Leu Lys Asp Ile Leu Glu Thr 100 105 110

Ile Ile Gly Val Glu Asp Val Ser Ile Val Val Asn Val Asp Ala Thr 115 120 125 Ser Leu Lys Ile Phe Glu Lys Asn Arg Lys Thr Gln Glu Thr Ser Thr 130 135 140 Asn Glu Thr Asp Lys Gln Gly Gly Lys Arg Thr Val Ser Glu Met Ser 155 145 150 Ser Asp Glu Glu Ile Val Ile Ile Lys Asn Gly Asp Lys Glu Thr Pro 170 175 165 Val Val Val Gln Thr Lys Lys Pro Asp Ile Arg Gly Val Leu Val Val 190 185 180 Ala Gln Gly Val Asp Asn Val Gln Ile Lys Lys Thr Ile Ile Glu Ala Val Thr Arg Val Leu Asp Val Pro Ser His Arg Val Ala Val Ala Pro 220 Lys Lys Met Lys Glu Asp Ser 225 <210> 64 <211> 1062 <212> DNA <213> Bacillus licheniformis <220> <221> CDS (498)..(980) <222> ctacgtctga aagcaccgta cagagcggtg aaggagaaaa agaagtgttc aagcccgcct 60 cagatgacaa accgaaggaa tcgatccaag attacgaaca ggaatatgaa aatcagctca 120 aagacatatt ggaaaccatc atcggcgttg aggacgtgtc aatcgtcgtc aatgttgatg 180 caacctcatt gaaaatattc gagaaaaaca gaaaaaccca ggaaacttca acgaatgaga 240 cagataaaca gggaggcaag cggacggtgt ctgaaatgtc ttcagacgaa gaaatcgtca 300 tcatcaaaaa cggagataaa gagacgcctg tcgtcgttca gacgaaaaag cccgatatca 360 420 qqqqtqttct cqttqtcqct caqqqaqtcq acaacgttca aataaaaaag accattattg aagcagtgac aagggttett gatgtteega gecaeegegt egetgttgee eetaaaaaaa 480

530

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	Met Me	t Leu Lys Ly 5	s Gln Thr Val T	rp Leu Leu 10
acc atg tta agt Thr Met Leu Ser 15				
ccc gaa gga gaa Pro Glu Gly Glu 30				
gct gaa aaa gaa Ala Glu Lys Glu 45	aaa ccg a Lys Pro M	et Lys Glu G	gag cct gcc aag Glu Pro Ala Lys 55	gat ggc aaa 674 Asp Gly Lys
gat gat acc gcg Asp Asp Thr Ala 60				
gat aaa gaa acg Asp Lys Glu Thr		er Glu Gln A		
gaa tca tcg ggt Glu Ser Ser Gly 95				
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aca gag ctc agc Thr Glu Leu Ser 140	gaa gct g Glu Ala G 145	aa gga acg g lu Gly Thr G	gaa aag acc ctt Glu Lys Thr Leu 150	gaa acc ctc 962 Glu Thr Leu 155
atc aaa aca aaa Ile Lys Thr Lys		aagacgcct to	ggtcaacgc cgacgg	gcgat 1010
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Val Val Val Leu Ser Val Tyr Tyr Ile Met Ser Pro Glu Gly Glu Asn

20

25

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gttctcagca cgaacc	cgat ggatttt	tta aaacaagaaa	cggcccctgg gcaga	acgctt 360										
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caa aaa caa gga a Gln Lys Gln Gly L 15	aaa aaa cgg at Lys Lys Arg I	tc cat ctt aaa le His Leu Lys 20	ttt gaa ttg tac Phe Glu Leu Tyr 25	gga 581 Gly										
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tgg aaa aag aaa a Trp Lys Lys Lys T 8														
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					gtg Val											1637
Ser					tta Leu					Lys					Glu	1685
380	-				385					390					395	

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Leu Gly Leu Phe Leu Thr Gly Leu Ser Leu Phe Trp Lys Lys Lys Thr 65 70 75 80

Pro Ser Phe Leu Thr Arg Arg Lys Ala Gly Leu Tyr Cys Ile Ile Ala 85 90 95

Ser Met Leu Leu Ser His Val Gln Leu Phe Gln His Leu Thr Glu 100 105 110

Arg Gly Met Val Gln Ser Pro Ser Val Ile Gln Asn Thr Trp Glu Leu 115 120 125

Phe Leu Met Asp Val Lys Gly Glu Thr Gly Ser Pro Asp Leu Gly Gly 130 135 140

Gly Met Ile Gly Ala Leu Leu Phe Ala Ala Ser Tyr Phe Leu Phe Ala 145 150 155 160

Ser Ala Gly Ser Lys Ile Ile Ala Val Phe Leu Ile Leu Ile Gly Leu 165 170 175

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Thr Pro Val Ala Ser Phe Met Lys Asn Gln Trp Gln Ala Phe Leu Ala 195 200 205

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Val	Gly 370	Val	Lys	Val	Ser	Lys 375	Ile	Val	Asn	Leu	Ser 380	Asp	Asp	Leu	Ala
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Lys	Ser	Ala	Ile	Gly 405	Ile	Glu	Val	Pro	Asn 410	Ala	Glu	Val	Ala	Met 415	Val
Ser	Leu	Lys	Glu	Val	Leu	Glu	Ser	Lys	Leu	Asn	Asp	Arg	Pro	Asp	Ala

Lys Leu Met Ile Gly Leu Gly Arg Asn Ile Ser Gly Glu Ala Val Leu Ala Glu Leu Asn Lys Met Pro His Leu Leu Val Ala Gly Ala Thr Gly Ser Gly Lys Ser Val Cys Val Asn Gly Ile Ile Thr Ser Ile Leu Met Arg Ala Lys Pro His Glu Val Lys Met Met Met Ile Asp Pro Lys Met Val Glu Leu Asn Val Tyr Asn Gly Ile Pro His Leu Leu Ala Pro Val Val Thr Asp Pro Lys Lys Ala Ser Gln Ala Leu Lys Lys Val Val Asn Glu Met Glu Arg Arg Tyr Glu Leu Phe Ser His Thr Gly Thr Arg Asn Ile Glu Gly Tyr Asn Asp Tyr Ile Lys Arg Met Asn Ala Ala Glu Glu Ala Lys Gln Pro Glu Leu Pro Tyr Ile Ile Val Ile Val Asp Glu Leu Ala Asp Leu Met Met Val Ala Ser Ser Asp Val Glu Asp Ser Ile Thr Arg Leu Ser Gln Met Ala Arg Ala Ala Gly Ile His Leu Ile Ile Ala Thr Gln Arg Pro Ser Val Asp Val Ile Thr Gly Val Ile Lys Ala Asn 615 , Ile Pro Ser Arg Ile Ala Phe Ser Val Ser Ser Gln Thr Asp Ser Arg Thr Ile Leu Asp Met Gly Gly Ala Glu Lys Leu Leu Gly Arg Gly Asp

Met Leu Phe Leu Pro Val Gly Ala Asn Lys Pro Leu Arg Val Gln Gly

660 665 670

Ala Phe Leu Ser Asp Glu Glu Val Glu Lys Val Val Asp His Val Ile 675

Ser Gln Gln Lys Ala Gln Tyr Gln Glu Glu Met Ile Pro Glu Glu Thr 690

695

700

Gln Glu Thr Val Ser Glu Val Thr Asp Asp Leu Tyr Asp Glu Ala Val 705 710 715 720

Ala Leu Val Val Ser Met Gln Thr Ala Ser Val Ser Met Leu Gln Arg
725 730 735

Arg Phe Arg Ile Gly Tyr Thr Arg Ala Ala Arg Leu Ile Asp Ala Met 740 745 750

Glu Glu Arg Gly Ile Val Gly Pro Tyr Glu Gly Ser Lys Pro Arg Glu
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Val Leu Leu Ser Lys Glu Gln Tyr Glu Glu Leu Ser Ser 770 775 780

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<220>

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cacgtctggg aggaagatac atg cgg aag ccc aca atc aaa gag ctc atc ttt Met Arg Lys Pro Thr Ile Lys Glu Leu Ile Phe 1 5 10	533
caa cat atg aag gac cat ctg tcg atc tat tta ttt gtt tct gtg ctg Gln His Met Lys Asp His Leu Ser Ile Tyr Leu Phe Val Ser Val Leu 15 20 25	581
ttc tta atg ggt gtg att ttc ggc gcg gtc atc gtc aac agc atg acg Phe Leu Met Gly Val Ile Phe Gly Ala Val Ile Val Asn Ser Met Thr 30 35 40	629
atc ggt caa aaa gaa gat ttg ttc tac tat ttg aat caa ttt ttt gga Ile Gly Gln Lys Glu Asp Leu Phe Tyr Tyr Leu Asn Gln Phe Phe Gly 45 50 55	677
cag ctt tcc gaa gga aaa gca gcc agc tca aag gaa atg ttt ttg cag Gln Leu Ser Glu Gly Lys Ala Ala Ser Ser Lys Glu Met Phe Leu Gln 60 65 70 75	725
agc ttt ctt cat aat atg aaa tat tta ggc tta atg tgg att ctc ggg Ser Phe Leu His Asn Met Lys Tyr Leu Gly Leu Met Trp Ile Leu Gly 80 85 90	773
ata tcc atc atc ggt ctg ccc gtc att ttt atc atg gtc ttc tta aaa Ile Ser Ile Ile Gly Leu Pro Val Ile Phe Ile Met Val Phe Leu Lys 95 100 105	821
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atc aac ggc ttt ttc ctg tct ttt gtc tcc gtg ctc ccg caa aat att Ile Asn Gly Phe Phe Leu Ser Phe Val Ser Val Leu Pro Gln Asn Ile 125 130 135	917
ctg ctg atc ccg gcg tac ttg atc atg ggc acc tgc gcc atc gcc ttt Leu Leu Ile Pro Ala Tyr Leu Ile Met Gly Thr Cys Ala Ile Ala Phe 140 145 150 155	965
tcg atg agg ctc atc cgc cag ctt ttt gta aac gca gcc ttc aga agc Ser Met Arg Leu Ile Arg Gln Leu Phe Val Asn Ala Ala Phe Arg Ser 160 165 170	1013
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<220> <221> CDS

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gaaaagaaag gtcctcaccg aagaagacct tcccgatgaa gagcaccgca aatcgtttct	180
cggtatagtc ggaggcctcg cagaggatga aaaaaggcag ctgatccatg aagtcctcgc	240
tccgctcggc cataacttaa tggtgacccc taaagaggtc gatacattta tcgatgatat	300
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taaaggaatg tataaccact aagatcaagg cggctggccc ggccgctttt tttcatgaca	420
tttagcattg ccggaacttg ttctacttcc tctatcttgt acatagtcta tttactagac	480
aagctctgga gggatttac aat gag aaa aag agg cag gaa tcg tca gtt tgt Asn Glu Lys Lys Arg Gln Glu Ser Ser Val Cys 1 5 10	532
gct ggc tgt aaa tgg aag aag cgc ggt tca gac agt att ctt att tat Ala Gly Cys Lys Trp Lys Lys Arg Gly Ser Asp Ser Ile Leu Ile Tyr 15 20 25	580
cgt cag cct gct gct cgt ttt tat ttt atc agg cgt gct cac atc gct Arg Gln Pro Ala Ala Arg Phe Tyr Phe Ile Arg Arg Ala His Ile Ala 30 35 40	628
gcg tcc tca gtt aag gcc gtc ttc atc gtt gta ccg ggt ggc tca tca Ala Ser Ser Val Lys Ala Val Phe Ile Val Val Pro Gly Gly Ser Ser 45 50 55	676
act gaa ggg cga gac ctt tgg gct cat ttt ggg aat gga aaa cca cta Thr Glu Gly Arg Asp Leu Trp Ala His Phe Gly Asn Gly Lys Pro Leu 60 65 70 75	724
ctt tgc atc aga att gcc gga acc gaa tca gcg ctt tca gct ttc ccc Leu Cys Ile Arg Ile Ala Gly Thr Glu Ser Ala Leu Ser Ala Phe Pro 80 85 90	772
cct cgt cct gaa gct ggc gac cag cat tca ttt gaa aga tcc gcg aag Pro Arg Pro Glu Ala Gly Asp Gln His Ser Phe Glu Arg Ser Ala Lys 95 100 105	820
ttt tct cgg acg gga gct tcc ggg att ctc tca ttt tca ctc gga aat Phe Ser Arg Thr Gly Ala-Ser Gly Ile Leu Ser Phe Ser Leu Gly Asn 110 115 120	868
cct cat tgc cgg gca agg gac gga tta tac gaa tat gcc gtc aga atc Pro His Cys Arg Ala Arg Asp Gly Leu Tyr Glu Tyr Ala Val Arg Ile 125 130 135	916
tcc gcc gcc gac tca ggt ctt aaa aga gga gag aga agc gaa tct tgc Ser Ala Ala Asp Ser Gly Leu Lys Arg Gly Glu Arg Ser Glu Ser Cys 140 145 150 155	964

aga gct tca agg g Arg Ala Ser Arg G 1				
tca aca atc gac g Ser Thr Ile Asp G 175	gg cgg ccg caa ly Arg Pro Gln	agt cgt att tat Ser Arg Ile Tyr 180	cta caa tac Leu Gln Tyr 185	gca 1060 Ala
caa tac gga atc g Gln Tyr Gly Ile V 190		Phe Lys Arg Ser		
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Lys Lys Arg Gly S 20	er Asp Ser Ile	Leu Ile Tyr Arg 25	Gln Pro Ala 30	Ala
Arg Phe Tyr Phe I 35	le Arg Arg Ala 40	His Ile Ala Ala	Ser Ser Val 45	Lys
Ala Val Phe Ile V 50	al Val Pro Gly 55	Gly Ser Ser Thr	Glu Gly Arg	Asp
Leu Trp Ala His P 65	he Gly Asn Gly 70	Lys Pro Leu Leu 75	Cys Ile Arg	Ile 80
Ala Gly Thr Glu S		Ala Phe Pro Pro 90	Arg Pro Glu 95	Ala
Gly Asp Gln His S	er Phe Glu Arg	Ser Ala Lys Phe	Ser Arg Thr 110	Gly
Ala Ser Gly Ile L 115	eu Ser Phe Ser 120		His Cys Arg 125	Ala
Arg Asp Gly Leu T	yr Glu Tyr Ala 135	Val Arg Ile Ser 140	Ala Ala Asp	Ser

145 150	Arg Ser Glu Ser Cys 155	Arg Ala Ser Arg Glu 160
Thr Glu Lys Glu Asn Arg 165	Arg Gly Lys Thr Ser 170	Ser Thr Ile Asp Gly 175
Arg Pro Gln Ser Arg Ile 180	Tyr Leu Gln Tyr Ala 185	Gln Tyr Gly Ile Val 190
Ser Ser Pro Phe Lys Arg 195	Ser Gly Arg Ser Phe 200	
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taaaagtata aatttcatga a aaa gag aaa gag aag aat Lys Glu Lys Glu Lys Asn 5	cgt act tcc aaa atc	Met Ser Lys 1 aca aag ttg caa caa 163
aaa gag aaa gag aag aat Lys Glu Lys Glu Lys Asn	cgt act tcc aaa atc Arg Thr Ser Lys Ile 10 gta ttt ccg gcc atc	Met Ser Lys 1 aca aag ttg caa caa Thr Lys Leu Gln Gln 15 tat ttg aca agt gcc Tyr Leu Thr Ser Ala
aaa gag aaa gag aag aat Lys Glu Lys Glu Lys Asn 5 ttt ttt cgt aaa cgc tgg Phe Phe Arg Lys Arg Trp	cgt act tcc aaa atc Arg Thr Ser Lys Ile 10 gta ttt ccg gcc atc Val Phe Pro Ala Ile 30 gtt cta tgg tat caa	Met Ser Lys 1 aca aag ttg caa caa Thr Lys Leu Gln Gln 15 tat ttg aca agt gcc Tyr Leu Thr Ser Ala 35 tcg gct tct aac aac 259
aaa gag aaa gag aag aat Lys Glu Lys Glu Lys Asn 5 ttt ttt cgt aaa cgc tgg Phe Phe Arg Lys Arg Trp 20 25 gtc gtt gta tta acc gcc Val Val Val Leu Thr Ala	cgt act tcc aaa atc Arg Thr Ser Lys Ile 10 gta ttt ccg gcc atc Val Phe Pro Ala Ile 30 gtt cta tgg tat caa Val Leu Trp Tyr Gln 45 gca gac gat ggc aag	Met Ser Lys 1 aca aag ttg caa caa 163 Thr Lys Leu Gln Gln 15 tat ttg aca agt gcc 211 Tyr Leu Thr Ser Ala 35 tcg gct tct aac aac 259 Ser Ala Ser Asn Asn 50 aaa tca gcc tat gat 307
aaa gag aaa gag aag aat Lys Glu Lys Glu Lys Asn 5 ttt ttt cgt aaa cgc tgg Phe Phe Arg Lys Arg Trp 20 25 gtc gtt gta tta acc gcc Val Val Val Leu Thr Ala 40 gat gta aaa gac cag ctt Asp Val Lys Asp Gln Leu	cgt act tcc aaa atc Arg Thr Ser Lys Ile 10 gta ttt ccg gcc atc Val Phe Pro Ala Ile 30 gtt cta tgg tat caa Val Leu Trp Tyr Gln 45 gca gac gat ggc aag Ala Asp Asp Gly Lys 60 gaa gta ggc aaa cca	Met Ser Lys 1 aca aag ttg caa caa Thr Lys Leu Gln Gln 15 tat ttg aca agt gcc Tyr Leu Thr Ser Ala 35 tcg gct tct aac aac Ser Ala Ser Asn Asn 50 aaa tca gcc tat gat Lys Ser Ala Tyr Asp 65 gtc gaa aat gtc gca 355

											gca Ala					451
											ttg Leu					499
											ggt Gly					547
											gaa Glu					595
											gaa Glu 175					643
											gga Gly					691
aac Asn	ctt Leu	tac Tyr	aat Asn	gaa Glu 200	gaa Glu	ggc Gly	gga Gly	aac Asn	cat His 205	gtg Val	cat His	ttt Phe	gaa Glu	atc Ile 210	cgc Arg	739
											atg Met					787
tcc Ser	agc Ser	att Ile 230	gaa Glu	aaa Lys	gca Ala	atg Met	gag Glu 235	gaa Glu	caa Gln	gcg Ala	tct Ser	gaa Glu 240	gtg Val	aaa Lys	gaa Glu	835
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											aag Lys					931
											tct Ser					979
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tgt	tacaa	atc a	aaaa	aaaa	cc cg	gtato	caaat	cgg	gegga	agcc	agc	gtti	ttt a	aagta	aagagg	1095
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<211> 293

<212> PRT

<213> Bacillus licheniformis

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Thr Ser Ala Val Val Leu Thr Ala Val Leu Trp Tyr Gln Ser Ala
35 40 45

Ser Asn Asn Asp Val Lys Asp Gln Leu Ala Asp Asp Gly Lys Lys Ser 50 55 60

Ala Tyr Asp Asn Arg Asp Asp Ala Val Glu Val Gly Lys Pro Val Glu 65 70 75 80

Asn Val Ala Met Pro Val Ala Asp Ser Glu Asn Val Ser Val Val Lys 85 90 95

Lys Phe Phe Glu Thr Asp Ala Thr Lys Glu Glu Lys Glu Ala Ala Leu 100 105 110

Val Asn Tyr Asn Asn Thr Tyr Ser Met Ser Lys Gly Ile Asp Leu Ala 115 120 125

Glu Lys Asp Gly Lys Thr Phe Asp Val Ser Ala Ser Leu Ser Gly Thr 130 135 140

Val Ile Lys Ala Ala Lys Asp Pro Val Leu Gly Tyr Val Val Glu Val 145 150 155 160

Glu His Glu Asp Gly Leu Ser Thr Val Tyr Gln Ser Leu Ser Glu Val 165 170 175

Ser Val Lys Gln Gly Asp Lys Ile Glu Gln Asn Gln Val Ile Gly Lys 180 185 190

Ala Gly Lys Asn Leu Tyr Asn Glu Glu Gly Gly Asn His Val His Phe 195 200 205

210 215 Lys Pro Val Ser Ser Ile Glu Lys Ala Met Glu Glu Gln Ala Ser Glu 225 Val Lys Glu Pro Ala Gln Pro Ser Val Glu Glu Lys Ser Lys Thr Glu 245 250 Asp Lys Ala Lys Asp Gln Thr Asp Gly Lys Asp Asp Lys Thr Lys Arg 260 265 270 Glu Asp Ser Ser Glu Gly Ser Glu Asn Gln Asp Gly Thr Gln Ser Asp 275 280 Asp Ser Ser Gln Ser 290 <210> 74 <211> 1747 <212> DNA <213> Bacillus licheniformis <220> <221> CDS (501)..(1244) <222> <400> gctttaatcg cgggtaactt gcacagtaca accgacatcc cgttctgggt gcagtttgca 60 tgcgccatgg ccatgggact cggaacatct gtcggcggct ggaaaatcat caaaaccgtc 120 ggcggaaaaa tcatgaagat ccgtcccgtc aacggtgtct ctgcagattt gacgggagcc 180 ctcatcatct ttggcgcgac gatcgtccat ttgcctgtca gcacgacaca cgtcatttct 240 300 tcatccattt taggcgtggg cgcttcccac cgggtgaaag gcgtaaactg gggcaccgca aageggatge tgateacttg ggteattace etteceattt eggeaaceat eggtgeattt 360 gcctatttca tacttgattt attcttttaa tcagcacact cccgtccgaa tctaggacgg 420 gagttttcat gtttaaaaga aagccggcat aacaatagaa ataggaactg cactatttct 480 cgggaagagg gaaacaagtt atg ctg cta ttt tat caa ttc ctt gtt tgg ctt 533 Met Leu Leu Phe Tyr Gln Phe Leu Val Trp Leu

Glu Ile Arq Lys Asp Gly Val Ala Leu Asn Pro Leu Asn Phe Met Asp

5

10

1

						ctg Leu										581
						acg Thr										629
						gtg Val 50										677
						cat His										725
						ttc Phe										773
_		_				gat Asp		_	_			_	_			821
						caa Gln										869
_			_	_		cac His 130										917
_	_			_	_	ctc Leu					_	_		_		965
		_	_			gaa Glu										1013
						aac Asn										1061
						gaa Glu										1109
				_		gac Asp 210		_	_	_				_	_	1157
	_		_		_	tat Tyr		_						_		1205
tat	gat	ctt	ctg	cta	cca	aac	gaa	gag	gaa	ggt	gac	gac	tgat	ggag	gcc	1254

Tyr Asp Leu Leu Pro Asn Glu Glu Glu Gly Asp Asp 240 245

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aaaacgctga	acagaagaaa	aaacaaaccg	tgaagcttgg	actttcaccc	tccttctctg	1674
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<211> 248

<212> PRT

<213> Bacillus licheniformis

<400> 75

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Lys Thr Val Ala Ile Arg Lys Thr Trp Tyr Leu Leu Tyr Val Ile Gly 35 40 45

Ala Val Ile Tyr Trp Thr His Asp Pro Gln Ser Ile Phe Thr Asn Pro 50 55 60

Leu His Tyr Leu Ile Val Ala Val Phe Phe Thr Leu Thr Asp Ala Phe 65 70 75 80

Ile Phe Leu Asn Ala Tyr Phe Lys Lys Leu Gly Ser Ser Glu Leu Ala 85 90 95

Thr Asp Thr Arg Met Leu Leu Glu Glu Asn Asn Asp Leu Leu His Thr
100 105 110

Tyr Gln Asn Arg Leu Lys Thr Phe Gln Tyr Leu Leu Lys Asn Glu Pro 125 115 120 Ile His Ile Tyr Tyr Gly Asn Ile Glu Ala Tyr Ala Glu Gly Ile Glu Lys Leu Ile Lys Arg Phe Ala Glu Lys Met Asn Ile Ser Ala Ala Leu Cys Glu Tyr Asn Ser Glu Glu Ser Lys Asp His Leu Leu Glu His Met 170 165 Glu Asn Arg Phe Asp Val Gln Glu Lys Leu Asp Arg Lys Asp Val Tyr 185 180 Tyr Glu Glu Asn Gly Lys Met Val Leu Ile Pro Phe Ser Ile His Asp 205 200 195 Phe Asp Tyr Val Met Lys Leu Thr Ser Glu Asp Leu Val Thr Glu Phe 210 215 220 Asp Tyr Leu Leu Phe Thr Ser Leu Thr Ser Ile Tyr Asp Leu Leu Leu 240 235 225 Pro Asn Glu Glu Glu Gly Asp Asp 245 <210> 76 <211> 2020 <212> DNA <213> Bacillus licheniformis <220> <221> CDS (501)..(1742) <222> <400> 76 gattcactca tacgccatga gtgaaattga gccattggaa acaactatca agacgtatga 60 agttgagtta gaggaattaa aaacgaagag aaaagaactt ataaattgga ggctaaaaga 120 tattatttca gaagagattt taaaagagga aatggaagat ttacgagagg aagaaaaatt 180 aataataact cgaattgaaa aattacagca cctcattaaa ctcagagata aaaccttttt 240 aaccaatatc atttcaactt cactacacga tctaaagaac tttttcaata ttatcgaaga 300

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acaaggaagg gaggat	_	•	gt gtc gca att tac tgt rg Val Ala Ile Tyr Cys 10	533
aga gtt tct acc g Arg Val Ser Thr G 15	aa gag cag gc lu Glu Gln Al	a acg gaa gga a Thr Glu Gly 20	tac agc ata tct gcc Tyr Ser Ile Ser Ala 25	581
		r Thr Gln Leu	tat ggt tgg gag att Tyr Gly Trp Glu Ile 40	629
			aag aac att agc ggt Lys Asn Ile Ser Gly 55	677
			gaa aag gat aaa ttt Glu Lys Asp Lys Phe 75	725
Gln Ala Val Leu V			tca cga aat atg tta Ser Arg Asn Met Leu 90	773
			tat gga gta aag ttc Tyr Gly Val Lys Phe 105	821
		p Thr Gly Ser	cca att ggt cgt tta Pro Ile Gly Arg Leu 120	869
			gag cgt aat acg tta Glu Arg Asn Thr Leu 135	917
			gca tta gaa ggt tca Ala Leu Glu Gly Ser 155	965
Trp Asn Gly Gly V			att gaa aaa gag ctt Ile Glu Lys Glu Leu 170	1013
			caa atc tat caa cta Gln Ile Tyr Gln Leu 185	1061
		s Ser Ile Ala	aac tac tta aat aaa Asn Tyr Leu Asn Lys 200	1109

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											ggg Gly					1253	3
cct Pro	atc Ile	ctt Leu	gta Val 255	gaa Glu	gga Gly	cag Gln	cat His	gaa Glu 260	gcc Ala	att Ile	att Ile	tcc Ser	gat Asp 265	gaa Glu	tta Leu	1301	1
tgg Trp	agt Ser	atg Met 270	gta Val	caa Gln	gca Ala	agg Arg	cgg Arg 275	aaa Lys	agt Ser	aaa Lys	tca Ser	ttt Phe 280	aaa Lys	caa Gln	agg Arg	1349	€
caa Gln	tct Ser 285	aat Asn	gaa Glu	cca Pro	ttt Phe	tta Leu 290	ctt Leu	agc Ser	agt Ser	ctt Leu	tta Leu 295	cgt Arg	tgc Cys	ccc Pro	gat Asp	1391	7
tgt Cys 300	ggt Gly	caa Gln	ggt Gly	atg Met	gtt Val 305	cct Pro	gcc Ala	att Ile	aca Thr	aca Thr 310	aat Asn	aaa Lys	cga Arg	aag Lys	gat Asp 315	1445	5
gga Gly	aca Thr	aag Lys	aag Lys	aaa Lys 320	tat Tyr	cgt Arg	tat Tyr	tat Tyr	gtt Val 325	tgc Cys	tct Ser	aac Asn	ttt Phe	cat His 330	aac Asn	1493	3
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cag Gln	tta Leu 365	ttc Phe	tct Ser	aaa Lys	ctt Leu	caa Gln 370	tct Ser	ata Ile	aat Asn	act Thr	act Thr 375	tcg Ser	att Ile	gaa Glu	tct Ser	163°	7
tta Leu 380	aac Asn	caa Gln	ctc Leu	aat Asn	agt Ser 385	gaa Glu	ttg Leu	aaa Lys	caa Gln	tta Leu 390	gaa Glu	aat Asn	cgc Arg	cta Leu	tca Ser 395	168	5
gaa Glu	ata Ile	caa Gln	gag Glu	tac Tyr 400	aga Arg	atc Ile	gtt Val	act Thr	tgg Trp 405	aag Lys	cat His	ttg Leu	agc Ser	aaa Lys 410	aga Arg	1733	3
	tac Tyr		tag	caat	ctt	gcaa	gaac	ga t	tacaç	gcat	g tci	tctaa	aaga			178:	2

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atcatcaaga gaaagcaaaa cagttactca acttttgctt ataaattaca gtaagcatca 1962
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<211> 414

<212> PRT

<213> Bacillus licheniformis

<400> 77

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Asp Glu Gly Ile Ser Gly Lys Asn Ile Ser Gly Arg Pro Ala Met Gln 50 55 60

Lys Leu Ile Ser Asp Val Glu Lys Asp Lys Phe Gln Ala Val Leu Val 65 70 75 80

Trp Lys Ile Ser Arg Leu Ser Arg Asn Met Leu Asp Thr Leu Thr Leu 85 90 95

Leu Asp Lys Phe Glu Asp Tyr Gly Val Lys Phe Ile Ser Tyr Ser Glu 100 105 110

Asn Phe Asp Thr Gly Ser Pro Ile Gly Arg Leu Val Val Gln Leu Met 115 120 125

Ala Ser Ile Ala Glu Met Glu Arg Asn Thr Leu Ser Glu Asn Val Lys 130 135 140

Leu Gly Met Lys Gln Arg Ala Leu Glu Gly Ser Trp Asn Gly Gly Val 145 150 155 160

Val Phe Gly Tyr Asp Thr Ile Glu Lys Glu Leu Val Ile Asn Lys Lys

|--|

Glu	Ala	Glu	Ile 180	Val	Gln	Gln	Ile	Tyr 185	Gln	Leu	Tyr	Ala	Asn 190	Gly	Lys
Gly	Leu	Lys 195	Ser	Ile	Ala	Asn	Tyr 200	Leu	Asn	Lys	Ala	Gly 205	Tyr	Arg	Thr
Lys	Arg 210	Asn	Сув	Tyr	Phe	Ser 215	Ile	Asn	Gly	Val	Ala 220	Gln	Ile	Leu	Asp
Asn 225	Val	Ile	Tyr	Asn	Gly 230	Lys	Ile	Ser	Trp	Leu 235	Lys	Val	Glu	Asn	Trp 240
Asp	Thr	Lys	Arg	Arg 245	Arg	Gly	Lys	Asn	Pro 250	Asn	Pro	Ile	Leu	Val 255	Glu
•	Gln		260					265					270		
	Arg	275					280					285			
	Leu 290					295					300				
305	Pro				310				_	315					320
-	Arg	-	-	325	-				330		_			335	
Cys	Arg	Ala	Asn 340	Ser	Ile	Lys	Ala	Tyr 345	Asp	Ala	Glu	Tyr	Glu 350	Val	Ile

370 375 380

Leu Gln Ser Ile Asn Thr Thr Ser Ile Glu Ser Leu Asn Gln Leu Asn

Asn Lys Ile Glu Lys Ile Leu Ser Asn Gln Asn Gln Leu Phe Ser Lys

360

355

Ser Glu Leu Lys Gln Leu Glu Asn Arg Leu Ser Glu Ile Gln Glu Tyr 385 390 395 400

Arg Ile Val Thr Trp Lys His Leu Ser Lys Arg Pro Tyr Gln 405 $\,$ 410

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cga aaa Arg Lys 10															58	81
ccc ttt Pro Phe 25			_												62	29
aca gco Thr Ala															6′	77
gga agt Gly Se															72	25
gcg cto															7	73

gcc Ala	att Ile 90	gcc Ala	tac Tyr	aaa Lys	ggc Gly	cag Gln 95	ttt Phe	gaa Glu	ccc Pro	gca Ala	aac Asn 100	caa Gln	atc Ile	aaa Lys	ccg Pro	821	
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														atc Ile		1253	
	gga Gly 250															1298	
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gat	taaatggacg gagctcttca ccaagcttca cattcatccg c gatcggtatc atgacaggac atattaaagg cgcgtgtttt g											gtttaatgca cccaggaag 141					

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<212> PRT

<213> Bacillus licheniformis

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- Gly Gly Asp Phe Pro Pro Pro Glu Gly Ser Ser Leu Leu Ile Asn Gly 50 60
- Lys His Pro Leu Val Lys Ala Asp Ala Leu Ile Leu Lys Cys Leu Leu 65 70 75 80
- Ser Ala Cys Leu Val Leu Val Ser Ala Ile Ala Tyr Lys Gly Gln Phe 85 90 95
- Glu Pro Ala Asn Gln Ile Lys Pro Val Ile Ser Gln Val Phe Thr Glu 100 105 110
- Glu Phe Gln Phe Ala Ala Leu Gln Asn Trp Tyr Glu Ser Lys Phe Gly
 115 120 125
- Asp Pro Leu Ala Phe Phe Gln Pro Lys Gly Ala Lys Pro Ser Gly Gln 130 135 140
- Val Glu Val Asn Gln Asp Leu Ala Val Pro Ala Val Gly Lys Val Gln 145 150 155 160
- Glu Lys Phe Ser Gly Gln Gly Ile Lys Val Glu Thr Glu Asp Glu Thr 165 170 175
- Ile Arg Ser Met Lys Glu Gly Tyr Val Ile Glu Val Asp Lys Asn Pro 180 185 190
- Glu Thr Gly Leu Thr Val Val Leu Gln His Ala Asp Asn Ser Tyr Thr 195 200 205
- Tyr Tyr Gly Gln Leu Lys Lys Ala Asp Val Ala Leu Tyr Asp Tyr Ile 210 215 220
- Asp Lys Gly Thr Lys Leu Gly Thr Ile Glu Gln Asp Lys Asn Gln Lys 225 230 235 240

Gly Ile Tyr Tyr Phe Ala Ile Lys Gln Gly Glu Glu Phe Val Asp Pro 245 250 255

Ile Gln Val Ile Thr Phe Glu 260

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gtt ccg gtt aca ggg ttt gcc aac agt atg acg agc gca gcg ctg gag Val Pro Val Thr Gly Phe Ala Asn Ser Met Thr Ser Ala Ala Leu Glu 95 100 105	1299
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Val Phe His Phe Asp Glu Lys Thr Ala Gly Asn Pro Thr Val Ala Thr 55 Leu Ile Leu Ile Ser Ala Leu Leu Thr Gly Leu Gly Val Tyr Asp Arg 75 Ile Gly Gln Phe Ala Gly Ala Gly Ser Ala Val Pro Val Thr Gly Phe 85 Ala Asn Ser Met Thr Ser Ala Ala Leu Glu His Lys Ser Glu Ser Tyr 100 105 Val Leu Gly Val Trp Thr Asn Met Phe Lys Leu Ala Gly Asn Val Ile 115 Val Phe Gly Val Val Ala Ala Tyr Ile Val Gly Met Ile Arg Phe Ala 135 Phe Asp Lys Leu Phe 145 <210> 82 <211> 1453 <212> DNA <213> Bacillus licheniformis <220> <221> CDS (504)..(950) <222> <400> 82 tatcaqcttq atttqqacca ttatgtggcc atgcacgaaa acaaagaaac gacaaaggat 60 attcatgatc attagcgtga tatttatcat ctttctcgga ctcgcaggag gggttgctgt 120 tggatccggc tttgtcgctt ttcttaccgt gcttggcatt atcccgaggc tgactcagct 180 240 qacqaaaaca aaaggattta tccaggcgta tgaatgggct gtcattttag gcgcggtttt cggaggatgg gaatcgctga acatgtcccg ctttttttta tccaaatggc tgcttgttcc 300 360 gatcggcctt tttgcgggcg ttttcattgg aatgcttgca gcggcgctaa cagaagtctt 420 qaacqtqctq ccqatactqq cqaaacqcat cgggatggga gaccggattt tgatactttt aatqqccatt qttttcqqca aqattctcqq atcqatqttc caatggctca tttttgttca 480

533

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	1 5	10	
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cag aat ttt tat atg gct g Gln Asn Phe Tyr Met Ala V 45			677
aac ccg acg gtt gcc acg c Asn Pro Thr Val Ala Thr I 60			725
ctt ggc gtc tac gac aga a Leu Gly Val Tyr Asp Arg 1 75 80			773
gtt ccg gtt aca ggg ttt g Val Pro Val Thr Gly Phe A 95			821
cat aaa agc gaa agc tac g His Lys Ser Glu Ser Tyr V 110			869
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ggg atg atc cgc ttt gcc t Gly Met Ile Arg Phe Ala I 140		taggaggaaa acatcatgaa	970
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<211> 149

<212> PRT

<213> Bacillus licheniformis

<400> 83

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Gly Leu Ile Cys Thr Ile Gly Gln Ala Phe Gln Asn Phe Tyr Met Ala 35 40 45

Val Phe His Phe Asp Glu Lys Thr Ala Gly Asn Pro Thr Val Ala Thr 50 55 60

Leu Ile Leu Ile Ser Ala Leu Leu Thr Gly Leu Gly Val Tyr Asp Arg 65 70 75 80

Ile Gly Gln Phe Ala Gly Ala Gly Ser Ala Val Pro Val Thr Gly Phe 85 90 95

Ala Asn Ser Met Thr Ser Ala Ala Leu Glu His Lys Ser Glu Ser Tyr 100 105 110

Val Leu Gly Val Trp Thr Asn Met Phe Lys Leu Ala Gly Asn Val Ile 115 120 125

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	gtt cag tcc Val Gln Ser 65					725
	atc ttt ttg Ile Phe Leu 80					773
	gtg gcg cgg Val Ala Arg 95		Ile Pro			821
	tcg aca tca Ser Thr Ser					869
	ggt ttc gca Gly Phe Ala					917
	gca gaa agg Ala Glu Arg 145					965

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20 25 30

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Lys Asn Trp Glu Met Ala Glu Arg Lys Leu Met Glu Asp Ala Val Gln 50 55 60

Ser Ala Leu Ser Lys Gln Asn Leu Lys Lys Glu Asp Ile Asp Ile Phe 70 75 80

Leu Ala Gly Asp Leu Leu Asn Gln Asn Val Thr Ala Asn Tyr Val Ala 85 90 95

Arg His Leu Lys Ile Pro Phe Leu Cys Leu Phe Gly Ala Cys Ser Thr 100 105 110

Ser Met Glu Ser Ile Ala Ile Ser Ser Ala Leu Ile Asp Gly Gly Phe 115 120 125

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Ala Thr Ser Thr Val Thr Gly Ser Gly Ala Val Val Leu Ser Gln Gln

165 170 175

Pro Gly Gly Ile Lys Ile Thr Ser Ala Thr Val Gly Arg Val Ile Asp 180 185 190

Leu Gly Ile Thr Asp Ser Gln Asp Met Gly Ser Ala Met Ala Pro Ala 195 200 205

Ala Ala Asp Thr Ile Lys Gln His Leu Glu Asp Leu Gly Arg Thr Pro 210 215 220

Asp Asp Tyr Asp Leu Ile Leu Thr Gly Asp Leu Ser Gly Val Gly Ser 225 230 235 240

Pro Ile Leu Lys Asp Leu Leu Lys Glu Glu Gly Ile Asn Val Gly Thr 245 250 255

Lys His Asn Asp Cys Gly Leu Met Ile Tyr Thr Pro Asp Gln Gln Val 260 265 270

Phe Ala Gly Gly Ser Gly Cys Ala Cys Ser Ala Val Val Thr Phe Ala 275 280 285

His Ile Phe Lys Glu Ile Glu Ala Gly Arg Leu Asn Arg Val Leu Val 290 295 300

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<211> 2473

<212> DNA

<213> Bacillus licheniformis

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ggg Gly	cat His	gtc Val	atc Ile 255	gtg Val	atc Ile	gtc Val	gat Asp	acg Thr 260	tcg Ser	cca Pro	agc Ser	gtc Val	atc Ile 265	atc Ile	aca Thr	1301
					cac His											1349
acg Thr	ccg Pro 285	gct Ala	gtt Val	ggg Gly	acg Thr	ttt Phe 290	tta Leu	agg Arg	tgg Trp	gtg Val	cgg Arg 295	ttt Phe	ttc Phe	ggt Gly	att Ile	1397
					ttg Leu 305											1445
					gat Asp											1493
					atc Ile											1541
					gcc Ala											1589
					gcc Ala											1637
gtc	ggc	ttg	ttt	tct	ccc	gaa	gtc	att	tta	tac	gtt	tcc	ctc	tcg	gca	1685

Val Gly Leu Phe Ser Pro Glu Val Ile Leu Tyr Val 380 385 390	Ser Leu Ser Ala 395
atc gga gcc tac acg aca cca agc tac gag ctg agc Ile Gly Ala Tyr Thr Thr Pro Ser Tyr Glu Leu Ser 400 405	ctg gcg aat aaa 1733 Leu Ala Asn Lys 410
atg gtg aag ctg ttt atg ctg ata ttg gtg gcg ctt Met Val Lys Leu Phe Met Leu Ile Leu Val Ala Leu 415 420	
gga ttt gtc atc gga tta acg atc tta act ata gtg Gly Phe Val Ile Gly Leu Thr Ile Leu Thr Ile Val 430 435	atg act tcg atc 1829 Met Thr Ser Ile 440
agg tca ttg cga acg cct tac tta tgg cct ctc ctcArg Ser Leu Arg Thr Pro Tyr Leu Trp Pro Leu Leu445450	
aaa gcg ttt tgg cat gtt ctc gtg cgc acg tcc gtt Lys Ala Phe Trp His Val Leu Val Arg Thr Ser Val 460 465 470	cca ggg gga aaa 1925 Pro Gly Gly Lys 475
gtc agg ccg agc atc gtt cat ccg aga aac cgc tcc Val Arg Pro Ser Ile Val His Pro Arg Asn Arg Ser 480 485	
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<211> 490

<212> PRT

<213> Bacillus licheniformis

<400> 87

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Arg Ala Asp Val Ala Ala Ser His Ile Leu Glu Gly His Val Ile Val

245 250 255

Ile Val Asp Thr Ser Pro Ser Val Ile Ile Thr Pro Thr Thr Leu Phe 260 265 270

His His Val Gln His Ala Glu Glu Tyr Arg Gln Thr Pro Ala Val Gly 275 280 285

Thr Phe Leu Arg Trp Val Arg Phe Phe Gly Ile Leu Ala Ser Thr Phe 290 295 300

Leu Leu Pro Leu Trp Leu Leu Phe Val Ile His Pro Ser Leu Leu Pro 305 310 315 320

Asp Asn Leu Ser Phe Ile Gly Leu Asn Lys Asp Thr His Ile Pro Ile 325 330 335

Ile Met Gln Ile Phe Leu Ala Asp Leu Gly Val Glu Phe Leu Arg Met 340 345 350

Ala Ala Ile His Thr Pro Thr Ala Leu Ser Thr Ala Met Gly Leu Ile 355 360 365

Ala Ala Val Leu Ile Gly Asp Ile Ala Ile Asn Val Gly Leu Phe Ser 370 375 380

Pro Glu Val Ile Leu Tyr Val Ser Leu Ser Ala Ile Gly Ala Tyr Thr 385 390 395 400

Thr Pro Ser Tyr Glu Leu Ser Leu Ala Asn Lys Met Val Lys Leu Phe 405 410 415

Met Leu Ile Leu Val Ala Leu Phe Lys Val Glu Gly Phe Val Ile Gly
420 425 430

Leu Thr Ile Leu Thr Ile Val Met Thr Ser Ile Arg Ser Leu Arg Thr 435 440 445

Pro Tyr Leu Trp Pro Leu Leu Pro Phe Asn Gly Lys Ala Phe Trp His 450 455 460

Val Leu Val Arg Thr Ser Val Pro Gly Gly Lys Val Arg Pro Ser Ile 465 470 475 480

Val His Pro Arg Asn Arg Ser Arg Gln Pro 485 490

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cagccgcttt acgagctgtc tgtcacagca aagccgaaga acattccgca gacgatcg	gag 180
gttgatattt ccagtctcga agtcaatgat gttctaaccg tcggcgatat tccgacca	aaa 240
ggcgattatt catacaacca tgagcctgat gaagttgttg catccattct tcctcctc	caa 300
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tgtgctagaa tgaggggaaa ttaggatgct ccccctcagt atgctgaggc agggttt	tgc 480
ttaagggagg atatagaata atg ctt gtg ttt gca gga ttg ggc aat ccg g Met Leu Val Phe Ala Gly Leu Gly Asn Pro G 1 5 10	
aaa aca tat gaa aat acg aga cac aat gta ggt ttt atg acg att gad Lys Thr Tyr Glu Asn Thr Arg His Asn Val Gly Phe Met Thr Ile Asp 15 20 25	c 581 p
gag ctc tcg aaa gag tgg aac att ccg ctt gat aaa aca aag ttc aac Glu Leu Ser Lys Glu Trp Asn Ile Pro Leu Asp Lys Thr Lys Phe Ass 30 35 40	
gga caa tac gga atc ggg ttt gtt tcc ggc aaa aag gtt cta ctt gtt Gly Gln Tyr Gly Ile Gly Phe Val Ser Gly Lys Lys Val Leu Leu Val 45 50 55	
aag ccg ctt aca tat atg aat tta tcg gga gaa tgt ttg agg ccg ctt Lys Pro Leu Thr Tyr Met Asn Leu Ser Gly Glu Cys Leu Arg Pro Leu 60 65 70 75	
ttg gac tat tac gag atc cct gtt gac aat ttg aaa gtg att tac gat Leu Asp Tyr Tyr Glu Ile Pro Val Asp Asn Leu Lys Val Ile Tyr Asp 80 85 90	

gat ttg gat ctt ccg acc gga aga atc cgt ctg agg acg aaa gga agc Asp Leu Asp Leu Pro Thr Gly Arg Ile Arg Leu Arg Thr Lys Gly Ser 95 100 105	821
gca gga ggc cat aac ggc atc aaa tcg acg att cag cat ctg gga aca Ala Gly Gly His Asn Gly Ile Lys Ser Thr Ile Gln His Leu Gly Thr 110 115 120	869
agt gag ttt aac cgg atc aga atc gga ata ggc cgt ccg gta aac ggc Ser Glu Phe Asn Arg Ile Arg Ile Gly Ile Gly Arg Pro Val Asn Gly 125 130 135	917
atg aaa gtc gtc gat tat gtg ctt ggc gct ttt aca gat gaa gaa gag Met Lys Val Val Asp Tyr Val Leu Gly Ala Phe Thr Asp Glu Glu 140 145 150 155	965
ccg gcg ata aaa gag gcc gtc aga caa tcg gcc aag gcc tgt gaa gct Pro Ala Ile Lys Glu Ala Val Arg Gln Ser Ala Lys Ala Cys Glu Ala 160 165 170	1013
tct ttg gaa aaa cct ttt tta gaa gtc atg aat gaa ttt aac gca aag Ser Leu Glu Lys Pro Phe Leu Glu Val Met Asn Glu Phe Asn Ala Lys 175 180 185	1061
gta taaggcaaaa gggaacggaa catactagtc ttaaaaaagac tcggtatgga Val	1114
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tcatttgaac aatattcaat cctatataac aaaaagcgat gattttaaat ccatcgtcaa	1474
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<210> 89

<211> 188

<212> PRT

<213> Bacillus licheniformis

<400> 89

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20 25 30

Trp Asn Ile Pro Leu Asp Lys Thr Lys Phe Asn Gly Gln Tyr Gly Ile 35 40 45

Gly Phe Val Ser Gly Lys Lys Val Leu Leu Val Lys Pro Leu Thr Tyr 50 55 60

Met Asn Leu Ser Gly Glu Cys Leu Arg Pro Leu Leu Asp Tyr Tyr Glu 65 70 75 80

Ile Pro Val Asp Asn Leu Lys Val Ile Tyr Asp Asp Leu Asp Leu Pro 85 90 95

Thr Gly Arg Ile Arg Leu Arg Thr Lys Gly Ser Ala Gly Gly His Asn 100 105 110

Gly Ile Lys Ser Thr Ile Gln His Leu Gly Thr Ser Glu Phe Asn Arg 115 120 125

Ile Arg Ile Gly Ile Gly Arg Pro Val Asn Gly Met Lys Val Val Asp 130 135 140

Tyr Val Leu Gly Ala Phe Thr Asp Glu Glu Glu Pro Ala Ile Lys Glu 145 150 155 160

Ala Val Arg Gln Ser Ala Lys Ala Cys Glu Ala Ser Leu Glu Lys Pro 165 170 175

Phe Leu Glu Val Met Asn Glu Phe Asn Ala Lys Val

<210> 90

<211> 2097

<212> DNA

<213> Bacillus licheniformis

<220>

<221> CDS

<222> (501)..(1598)

<400> 90

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gtccgccttt caaaagccgg tcattttgct ggcagggggg cttgaccgcg gaaatgaatt	180
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gccgaagttt gagaagctgg ccgaagaaat gggaatacaa caggttaaac gtgtcgataa	300
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agagcttggg gtgttcggct ttg caa aca aaa aaa acg tca ccg gat ttt ttg Leu Gln Thr Lys Lys Thr Ser Pro Asp Phe Leu 1 5 10	533
ctg gtt atc att acg cta ttg ctt tta aca atc gga ctg att atg gta Leu Val Ile Ile Thr Leu Leu Leu Thr Ile Gly Leu Ile Met Val 15 20 25	581
tac agc gcc agt gca gta tgg gcg act tac aaa tac gac gac tcc ttt Tyr Ser Ala Ser Ala Val Trp Ala Thr Tyr Lys Tyr Asp Asp Ser Phe 30 35 40	629
ttc ttt gcg aaa cgg cag ctt ttg ttt gcc ggc atc ggg gtc atc gcc Phe Phe Ala Lys Arg Gln Leu Leu Phe Ala Gly Ile Gly Val Ile Ala 45 50 55	677
atg ttt ttc atc atg aac gtc gac tac tgg acg tgg agg act tat gcg Met Phe Phe Ile Met Asn Val Asp Tyr Trp Thr Trp Arg Thr Tyr Ala 60 65 70 75	725
aaa ata ctg atc att gta tgt ttc ttt ctg ctc atc atc gtc ctg gtt Lys Ile Leu Ile Ile Val Cys Phe Phe Leu Leu Ile Ile Val Leu Val 80 85 90	773
ccc ggg atc ggc atg gaa cgg aac ggg tcg agg agc tgg atc gga gtc Pro Gly Ile Gly Met Glu Arg Asn Gly Ser Arg Ser Trp Ile Gly Val 95 100 105	821
ggc gct ttc agc att cag ccg tcc gag ttt atg aaa ctc gcg atg atc Gly Ala Phe Ser Ile Gln Pro Ser Glu Phe Met Lys Leu Ala Met Ile 110 115 120	869
gca ttt ttg gcc aag ttt tta tct gaa aag caa aag aat att acg tcg Ala Phe Leu Ala Lys Phe Leu Ser Glu Lys Gln Lys Asn Ile Thr Ser 125 130 135	917
ttt aga aaa ggc ttt gtg ccg gcg ctg ggc att gtc ttt tca gct ttt Phe Arg Lys Gly Phe Val Pro Ala Leu Gly Ile Val Phe Ser Ala Phe 140 145 150 155	965
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ctg tcg gcg ccg tac cgg atc aaa agg atc act tca tac ttg aac cct Leu Ser Ala Pro Tyr Arg Ile Lys Arg Ile Thr Ser Tyr Leu Asn Pro 205 210 215	1157
tgg gag gac cct tta gga agc ggc ttt caa atc att cag tct ctt tat Trp Glu Asp Pro Leu Gly Ser Gly Phe Gln Ile Ile Gln Ser Leu Tyr 220 225 230 235	1205
gcg gtg ggg ccc ggc ggg ctg ttc ggc ctc ggc ctc ggc cag agc agg Ala Val Gly Pro Gly Gly Leu Phe Gly Leu Gly Leu Gly Gln Ser Arg 240 245 250	1253
caa aag ttt ttc tat ctg cct gag ccg cag aca gat ttt att ttt gcg Gln Lys Phe Phe Tyr Leu Pro Glu Pro Gln Thr Asp Phe Ile Phe Ala 255 260 265	1301
att tta tca gag gag ctc ggc ttt atc ggc gga tcg ctg att ctt ttg Ile Leu Ser Glu Glu Leu Gly Phe Ile Gly Gly Ser Leu Ile Leu Leu 270 275 280	1349
ctc ttc agc gtt cta tta tgg aga ggc atc aga atc gcg ctc ggt gcg Leu Phe Ser Val Leu Leu Trp Arg Gly Ile Arg Ile Ala Leu Gly Ala 285 290 295	1397
ccc gat tta tac ggc agt ttt gtc gcc gtc ggc gtc att tcg atg ata Pro Asp Leu Tyr Gly Ser Phe Val Ala Val Gly Val Ile Ser Met Ile 300 305 310 315	1445
gcg att cag gtt atg atc aat atc gga gtc gtg act ggt ttg att cct Ala Ile Gln Val Met Ile Asn Ile Gly Val Val Thr Gly Leu Ile Pro 320 325 330	1493
gtt aca ggc att acg ctt ccg ttt tta agc tat ggc ggt tca tca ctg Val Thr Gly Ile Thr Leu Pro Phe Leu Ser Tyr Gly Gly Ser Ser Leu 335 340 345	1541
acc ttg atg ctc atg gcg gtc ggc gtg ctg ctg aat gtc agc agg tat Thr Leu Met Leu Met Ala Val Gly Val Leu Leu Asn Val Ser Arg Tyr 350 355 360	1589
tct aga tac tagattttgg cgataaccct gttgcgagat agcagggtta Ser Arg Tyr 365	1638
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cgccgcttca	aaactgggga	ttccgacgat	tatccacgaa	caaaacagcc	ttcccggact	2058
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- <211> 366
- <212> PRT
- <213> Bacillus licheniformis
- <400> 91

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Leu Leu Leu Thr Ile Gly Leu Ile Met Val Tyr Ser Ala Ser Ala 20 25 30

Val Trp Ala Thr Tyr Lys Tyr Asp Asp Ser Phe Phe Ala Lys Arg
35 40 45

Gln Leu Leu Phe Ala Gly Ile Gly Val Ile Ala Met Phe Phe Ile Met 50 55 60

Asn Val Asp Tyr Trp Thr Trp Arg Thr Tyr Ala Lys Ile Leu Ile Ile 65 70 75 80

Val Cys Phe Phe Leu Leu Ile Ile Val Leu Val Pro Gly Ile Gly Met 85 90 95

Glu Arg Asn Gly Ser Arg Ser Trp Ile Gly Val Gly Ala Phe Ser Ile 100 105 110

Gln Pro Ser Glu Phe Met Lys Leu Ala Met Ile Ala Phe Leu Ala Lys 115 120 125

Phe Leu Ser Glu Lys Gln Lys Asn Ile Thr Ser Phe Arg Lys Gly Phe 130 135 140

Val Pro Ala Leu Gly Ile Val Phe Ser Ala Phe Leu Ile Ile Met Met 145 150 155 160 Gln Pro Asp Leu Gly Thr Gly Thr Val Met Val Gly Thr Cys Ile Ile 165 Met Ile Phe Val Ala Gly Ala Arg Ile Ser His Phe Val Phe Leu Gly 185 Leu Ile Gly Leu Ser Gly Phe Val Gly Leu Val Leu Ser Ala Pro Tyr 200 Arg Ile Lys Arg Ile Thr Ser Tyr Leu Asn Pro Trp Glu Asp Pro Leu 215 220 Gly Ser Gly Phe Gln Ile Ile Gln Ser Leu Tyr Ala Val Gly Pro Gly 225 230 Gly Leu Phe Gly Leu Gly Leu Gly Gln Ser Arg Gln Lys Phe Phe Tyr 245 250 Leu Pro Glu Pro Gln Thr Asp Phe Ile Phe Ala Ile Leu Ser Glu Glu 260 265 Leu Gly Phe Ile Gly Gly Ser Leu Ile Leu Leu Phe Ser Val Leu 280 Leu Trp Arg Gly Ile Arg Ile Ala Leu Gly Ala Pro Asp Leu Tyr Gly 290 295 Ser Phe Val Ala Val Gly Val Ile Ser Met Ile Ala Ile Gln Val Met 305 310 Ile Asn Ile Gly Val Val Thr Gly Leu Ile Pro Val Thr Gly Ile Thr 325 330 Leu Pro Phe Leu Ser Tyr Gly Gly Ser Ser Leu Thr Leu Met Leu Met 340 345 Ala Val Gly Val Leu Leu Asn Val Ser Arg Tyr Ser Arg Tyr 355 360 <210> 92

<211> 1882 <212> DNA

<213> Bacillus licheniformis

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aaggtggaaa cccgcccgtc ccatgggggc gggctttttg tttttctgga tttcaattca	420
ccgctatttc ctttttgtca tatgatgaaa ttagcttatg aattagatcc ttgtcaaaaa	480
agaaggtgaa tgttagagcc atg tta acc gga ttg acg att gca atc atc ggc Met Leu Thr Gly Leu Thr Ile Ala Ile Ile Gly 1 5 10	533
ggc gat gca agg cag ctc gag atc atc cgc aag ctg acg gaa cag gat Gly Asp Ala Arg Gln Leu Glu Ile Ile Arg Lys Leu Thr Glu Gln Asp 15 20 25	581
gca aag gtc ttt tta atc ggt ttt gat cag ctt gat cac ggg ttt acc Ala Lys Val Phe Leu Ile Gly Phe Asp Gln Leu Asp His Gly Phe Thr 30 35 40	629
gga gct aca aaa cta aag ctg aac gaa ctt gat ttt ggc aca ata gac Gly Ala Thr Lys Leu Lys Leu Asn Glu Leu Asp Phe Gly Thr Ile Asp 45 50 55	677
agc att att ctg cct gta tcg ggc aca tcg atg gaa gga acg gtt gcg Ser Ile Ile Leu Pro Val Ser Gly Thr Ser Met Glu Gly Thr Val Ala 60 65 70 75	725
act gtt ttt tcc aat gaa aaa gtg gtg tta aaa cag gaa cat tta gaa Thr Val Phe Ser Asn Glu Lys Val Val Leu Lys Gln Glu His Leu Glu 80 85 90	773
aaa acc aag ccg cac tgc gcg att tat tca ggg att tca aac caa tat Lys Thr Lys Pro His Cys Ala Ile Tyr Ser Gly Ile Ser Asn Gln Tyr 95 100 105	821
tta gac ggc atg gcc aaa ggg gcg aac cgt cgt ctt atc aag ctc ttt Leu Asp Gly Met Ala Lys Gly Ala Asn Arg Arg Leu Ile Lys Leu Phe 110 115 120	869
gaa aga gac gat att gcg att tac aac tcg ata cct aca gtc gaa ggt	917

Glu	Arg 125	Asp	Asp	Ile	Ala	Ile 130	Tyr	Asn	Ser	Ile	Pro 135	Thr	Val	Glu	Gly	
gcc Ala 140	att Ile	atg Met	atg Met	gcc Ala	ata Ile 145	cag Gln	cat His	aca Thr	gac Asp	ttt Phe 150	acg Thr	att Ile	cac His	ggc Gly	tcg Ser 155	965
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acg Thr	ttc Phe	tcg Ser	gcg Ala 175	ctc Leu	ggc Gly	gca Ala	cgc Arg	gta Val 180	aaa Lys	gtc Val	gga Gly	gct Ala	cgc Arg 185	gac Asp	tcc Ser	1061
gcc Ala	cac His	ctc Leu 190	gcc Ala	aga Arg	atc Ile	atg Met	gag Glu 195	atg Met	ggc Gly	ctc Leu	act Thr	cct Pro 200	ttc Phe	cac His	aca Thr	1109
aac Asn	gaa Glu 205	ctt Leu	gca Ala	gag Glu	cat His	gtt Val 210	gaa Glu	aat Asn	atc Ile	gac Asp	ata Ile 215	tgc Cys	atc Ile	aat Asn	acc Thr	1157
														aca Thr		1205
aga Arg	aca Thr	tta Leu	att Ile	ctc Leu 240	gat Asp	tta Leu	gca Ala	acc Thr	cgt Arg 245	ccc Pro	gga Gly	ggc Gly	aca Thr	gat Asp 250	ttt Phe	1253
gat Asp	ttt Phe	gcc Ala	gaa Glu 255	aag Lys	caa Gln	ggc Gly	att Ile	aaa Lys 260	gcg Ala	ctg Leu	ctt Leu	gct Ala	cca Pro 265	gga Gly	ctt Leu	1301
ccc Pro	gly aaa	atc Ile 270	gtc Val	gcg Ala	cct Pro	aaa Lys	acg Thr 275	gcg Ala	gga Gly	cag Gln	atc Ile	att Ile 280	gcc Ala	aat Asn	gtt Val	1349
														ctg Leu		1397
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cttac						1882

<210> 93 <211> 299 <212> PRT <213> Bacillus licheniformis

<400> 93

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 1 5 10 15
- Leu Glu Ile Ile Arg Lys Leu Thr Glu Gln Asp Ala Lys Val Phe Leu 20 25 30
- Ile Gly Phe Asp Gln Leu Asp His Gly Phe Thr Gly Ala Thr Lys Leu 35 40 45
- Lys Leu Asn Glu Leu Asp Phe Gly Thr Ile Asp Ser Ile Ile Leu Pro 50 55 60
- Val Ser Gly Thr Ser Met Glu Gly Thr Val Ala Thr Val Phe Ser Asn 65 70 75 80
- Glu Lys Val Val Leu Lys Gln Glu His Leu Glu Lys Thr Lys Pro His 85 90 95
- Cys Ala Ile Tyr Ser Gly Ile Ser Asn Gln Tyr Leu Asp Gly Met Ala 100 105 110
- Lys Gly Ala Asn Arg Arg Leu Ile Lys Leu Phe Glu Arg Asp Asp Ile 115 120 125
- Ala Ile Tyr Asn Ser Ile Pro Thr Val Glu Gly Ala Ile Met Met Ala 130 135 140
- Ile Gln His Thr Asp Phe Thr Ile His Gly Ser Asn Val Met Val Leu 145 150 155 160
- Gly Leu Gly Arg Thr Gly Met Ser Ile Ser Arg Thr Phe Ser Ala Leu 165 170 175
- Gly Ala Arg Val Lys Val Gly Ala Arg Asp Ser Ala His Leu Ala Arg

180 185 190

Ile Met Glu Met Gly Leu Thr Pro Phe His Thr Asn Glu Leu Ala Glu
195 200 205

His Val Glu Asn Ile Asp Ile Cys Ile Asn Thr Ile Pro Ser Leu Ile 210 215 220

Leu Asp Lys His Val Leu Ser Arg Met Thr Pro Arg Thr Leu Ile Leu 225 230 235 240

Asp Leu Ala Thr Arg Pro Gly Gly Thr Asp Phe Asp Phe Ala Glu Lys 245 250 255

Gln Gly Ile Lys Ala Leu Leu Ala Pro Gly Leu Pro Gly Ile Val Ala 260 265 270

Pro Lys Thr Ala Gly Gln Ile Ile Ala Asn Val Leu Cys Asn Leu Leu 275 280 285

Ser Glu Leu Thr Thr Asp Arg Lys Gly Leu Ser 290 295

<210> 94

<211> 1588

<212> DNA

<213> Bacillus licheniformis

<220>

<221> CDS

<222> (501)..(1088)

<400> 94

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gaccgaaagg ggctg			ga aaa aga atc ly Lys Arg Ile		533
cta acg ggt tca Leu Thr Gly Ser 15			_	ln Ile Glu	581
gcg ctg atc aac Ala Leu Ile Asn 30					629
gtc aag tcg acg Val Lys Ser Thr 45	_				677
aga ata gaa gag Arg Ile Glu Glu 60					725
gct gag cct ctc Ala Glu Pro Leu					773
cca ttg acg gga Pro Leu Thr Gly 95			Ala Asn Ala G		821
agt ccg gtt ctc Ser Pro Val Leu 110				_	869
gtc gtc ctc ggc Val Val Leu Gly 125	_				917
aac ttg atg agg Asn Leu Met Arg 140					965
ggc cag gat gac Gly Gln Asp Asp				_	1013
gat ctt tta gtg Asp Leu Leu Val 175				s Gln Ile	1061
cag cct atc ctg Gln Pro Ile Leu 190			atctttt gaaaata	aaag	1108
atgtaacaaa aaata	tcaat caccac	eggca cacatet	atg ttaaaataaa	atgtaaaatg	1168
catagtcaac caatc	gttta cgacga	attaa ggtggaa	ngga gttttacaat	tgggcagagg	1228

attacatgta gcagtagttg gtgcgacagg cgctgtagga cagcaaatgt taaaaacact 1288
agaagacagg aattttgaac tggataaact gactttatta tcctcaaaac gttcagcagg 1348
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cgaggctgtc aaacgcgggg cgatcgtcat tgataatacg agcgcgttcc ggatggacca 1528
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<211> 196

<212> PRT

<213> Bacillus licheniformis

<400> 95

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Gly Ala Glu Val Arg Pro Val Val Thr His Thr Val Lys Ser Thr Asp 35 40 45

Thr Arg Phe Gly Glu Gly Glu Glu Trp Val Arg Arg Ile Glu Glu Leu 50 55 60

Thr Gly Phe Glu Val Ile Asp Ser Ile Pro Lys Ala Glu Pro Leu Gly 65 70 75 80

Pro Lys Thr Pro Leu Asp Cys Met Val Val Ala Pro Leu Thr Gly Asn 85 90 95

Ser Met Ser Lys Leu Ala Asn Ala Gln Thr Asp Ser Pro Val Leu Met 100 105 110

Ala Ala Lys Ala Thr Met Arg Asn Ser Arg Pro Val Val Leu Gly Ile 115 120 125

Ser Thr Asn Asp Ala Leu Gly Leu Asn Gly Val Asn Leu Met Arg Leu 130 135 140

Met Ala Ala Lys Asn Val Tyr Phe Ile Pro Phe Gly Gln Asp Asp Pro

145	150	155	160

Tyr Lys Lys Pro Asn Ser Leu Val Ala Lys Met Asp Leu Leu Val Pro 165 170 175

Ala Val Glu Glu Ala Leu Ser His Lys Gln Ile Gln Pro Ile Leu Val 180 185 190

His Asn Asp Gln 195

<210> 96 <211> 2167 <212> DNA

<213> Bacillus licheniformis

<220>
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<222> (501)..(1871)

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gaa gag tca atc tgt ttt caa aaa gga cag gaa gta tcc gaa tta tta 581
Glu Glu Ser Ile Cys Phe Gln Lys Gly Gln Glu Val Ser Glu Leu Leu
15 20 25

tcg att tca ttg gat cct gac att acc gtt cag gaa gta aat gat tat

Ser Ile Ser Leu Asp Pro Asp Ile Thr Val Gln Glu Val Asn Asp Tyr

30 35 40

gta tcc ata cga ggg tca tta gag ctg aca ggc gaa tac aac ata gat
Val Ser Ile Arg Gly Ser Leu Glu Leu Thr Gly Glu Tyr Asn Ile Asp
45 50 55

caa Gln 60	acc Thr	cgg Arg	gag Glu	tat Tyr	gca Ala 65	gag Glu	ctg Leu	cct Pro	gcg Ala	aca Thr 70	agc Ser	cga Arg	ttt Phe	gta Val	gaa Glu 75	725
gat Asp	gta Val	aag Lys	ctg Leu	aaa Lys 80	Gly 999	gac Asp	ggc Gly	agc Ser	gca Ala 85	gag Glu	ctg Leu	acg Thr	cat His	tgt Cys 90	ttc Phe	· 773
cca Pro	gtg Val	gat Asp	atc Ile 95	acc Thr	atc Ile	ccg Pro	aaa Lys	gac Asp 100	aaa Lys	gtc Val	aat Asn	cat His	tta Leu 105	aac Asn	gac Asp	821
					gac Asp											869
atg Met	ctg Leu 125	acg Thr	att Ile	cag Gln	gct Ala	gat Asp 130	ttg Leu	gcg Ala	att Ile	gaa Glu	ggc Gly 135	ctc Leu	ttg Leu	aat Asn	gtg Val	917
agc Ser 140	ggt Gly	gaa Glu	gcg Ala	ggt Gly	gaa Glu 145	gaa Glu	gaa Glu	ccg Pro	cgc Arg	act Thr 150	atg Met	cct Pro	gcg Ala	gcc Ala	gtc Val 155	965
cat His	ccg Pro	gaa Glu	gag Glu	gag Glu 160	ctc Leu	gaa Glu	cct Pro	gcc Ala	tac Tyr 165	aga Arg	tca Ser	cct Pro	tca Ser	aac Asn 170	gac Asp	1013
gaa Glu	gat Asp	cag Gln	ggt Gly 175	gaa Glu	gag Glu	aaa Lys	gaa Glu	tat Tyr 180	ttg Leu	atc Ile	cag Gln	ctt Leu	gac Asp 185	aga Arg	cct Pro	1061
tac Tyr	gaa Glu	gag Glu 190	cag Gln	gac Asp	gaa Glu	gaa Glu	cag Gln 195	gcg Ala	gaa Glu	gaa Glu	cat His	gat Asp 200	acc Thr	ggt Gly	gag Glu	1109
gaa Glu	acg Thr 205	gtt Val	ccg Pro	att Ile	tac Tyr	cag Gln 210	tcg Ser	ttt Phe	ctc Leu	gga Gly	aac Asn 215	gac Asp	aca Thr	gag Glu	gaa Glu	1157
gct Ala 220	aaa Lys	ccg Pro	ttt Phe	ttt Phe	aca Thr 225	gcg Ala	tct Ser	ttg Leu	tcg Ser	gcg Ala 230	gca Ala	gag Glu	cgt Arg	acg Thr	aag Lys 235	1205
cgc Arg	gaa Glu	ata Ile	gaa Glu	aat Asn 240	caa Gln	aaa Lys	gaa Glu	gcc Ala	tct Ser 245	ctt Leu	gaa Glu	cag Gln	ccg Pro	gaa Glu 250	gaa Glu	1253
gaa Glu	tat Tyr	aag Lys	ctg Leu 255	aaa Lys	aga Arg	gag Glu	aaa Lys	gtg Val 260	gaa Glu	gag Glu	gaa Glu	ccg Pro	gaa Glu 265	gaa Glu	tat Tyr	1301
gag Glu	ctg Leu	aaa Lys 270	Arg	gag Glu	aaa Lys	gtg Val	gaa Glu 275	gag Glu	gaa Glu	ccg Pro	gaa Glu	gaa Glu 280	tat Tyr	gag Glu	ctg Leu	1349

aaa aga gaa gaa g Lys Arg Glu Glu A 285				
caa cct cac gag g Gln Pro His Glu G 300				
ctt ctg aag gaa g Leu Leu Lys Glu A	= = =			Val
gag gtg aca cag g Glu Val Thr Gln 6 335				
cat acg att gaa a His Thr Ile Glu I 350		Ser Phe His		
gaa gaa gaa aga g Glu Glu Glu Arg A 365				
gca aag gaa aac g Ala Lys Glu Asn A 380	_	_		_
cag gga gag gag g Gln Gly Glu Glu G 4				
aat gat acg att g Asn Asp Thr Ile A 415			_	_
cag ctc atc cgg a Gln Leu Ile Arg M 430	_	Ser Leu Asp		
gga cag atc ctt t Gly Gln Ile Leu T 445				. 1871
taatgcattg ataaaa	aatgt ggtgaagcc	g atggaaggca	tccagtctgt ttta	aatgag 1931
tacggtctta cgcctg	gaata tatggagtc	c gtcagttcaa	aggtgtggaa agtg	tatacg 1991
gatcacggtg tatttg	gctct gaaaaaatt	g gcggcttcaa	gaaacacccg cttc	acggaa 2051
cagatgatca tgctgg	gagga aaaaggcta	c aggcagttcg	ttcctgtcta tcga	aaccgc 2111
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<210> 97 <211> 457

<212> PRT

<213> Bacillus licheniformis

<400> 97

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Phe Gln Lys Gly Gln Glu Val Ser Glu Leu Leu Ser Ile Ser Leu Asp 20 25 30

Pro Asp Ile Thr Val Gln Glu Val Asn Asp Tyr Val Ser Ile Arg Gly 35 40 45

Ser Leu Glu Leu Thr Gly Glu Tyr Asn Ile Asp Gln Thr Arg Glu Tyr 50 55 60

Ala Glu Leu Pro Ala Thr Ser Arg Phe Val Glu Asp Val Lys Leu Lys 65 70 75 80

Gly Asp Gly Ser Ala Glu Leu Thr His Cys Phe Pro Val Asp Ile Thr 85 90 95

Ile Pro Lys Asp Lys Val Asn His Leu Asn Asp Val Phe Val Phe Ile 100 105 110

Asp Ala Phe Asp Tyr Gln Leu Thr Asp Ala Arg Met Leu Thr Ile Gln
115 120 125

Ala Asp Leu Ala Ile Glu Gly Leu Leu Asn Val Ser Gly Glu Ala Gly 130 135 140

Glu Glu Glu Pro Arg Thr Met Pro Ala Ala Val His Pro Glu Glu Glu 145 150 155 160

Leu Glu Pro Ala Tyr Arg Ser Pro Ser Asn Asp Glu Asp Gln Gly Glu 165 170 175

Glu Lys Glu Tyr Leu Ile Gln Leu Asp Arg Pro Tyr Glu Glu Gln Asp 180 185 190

Glu Glu Gln Ala Glu Glu His Asp Thr Gly Glu Glu Thr Val Pro Ile 195 200 205

Tyr	Gln 210	Ser	Phe	Leu	Gly	Asn 215	Asp	Thr	Glu	Glu	Ala 220	Lys	Pro	Phe	Phe
Thr 225	Ala	Ser	Leu	Ser	Ala 230	Ala	Glu	Arg	Thr	Lys 235	Arg	Glu	Ile	Glu	Asn 240
Gln	Lys	Glu	Ala	Ser 245	Leu	Glu	Gln	Pro	Glu 250	Glu	Glu	Tyr	Lys	Leu 255	Lys
Arg	Glu	Lys	Val 260	Glu	Glu	Glu	Pro	Glu 265	Glu	Tyr	Glu	Leu	Lys 270	Arg	Glu
Lys	Val	Glu 275	Glu	Glu	Pro	Glu	Glu 280	Tyr	Glu	Leu	Lys	Arg 285	Glu	Glu	Ala
Glu	Glu 290	Glu	Pro	Glu	Leu	Ser 295	His	Ser	Ser	Tyr	Gln 300	Pro	His	Glu	Glu
Leu 305	Lys	Glu	Asn	Pro	Phe 310	Tyr	Ser	Val	Pro	Pro 315	Leu	Leu	Lys	Glu	Asp 320
Gln	Asn	Asp	Arg	Glu 325	Pro	Glu	Ala	Phe	Glu 330	Val	Glu	Val	Thr	Gln 335	Glu
Ala	Glu	Ala	Ile 340	Asp	Glu	Glu	Glu	Glu 345	Ala	Gly	His	Thr	Ile 350	Glu	Ile
Pro	Glu	Tyr 355	Ser	Phe	His	Glu	Gln 360	Thr	Glu	Pro	Glu	Glu 365	Glu	Arg	Asp
	370		Ala			375					380				
Asn 385	Ala	Leu	Tyr	Leu	Thr 390	Lys	Leu	Phe	Thr	Lys 395	Gln	Gly	Glu	Glu	Glu 400
			Met	405					410					415	
Leu	Leu	Cys	Glu 420	Arg	Tyr	Asp	Ile	Asn 425	Val	Gln	Gln	Leu	Ile 430	Arg	Met
Asn	Ser	Leu	Ser	Leu	Asp	Glu	Glu	Leu	Lys	Glu	Gly	Gln	Ile	Leu	Tyr

435 440 445

455

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					ttc Phe											821
					ggc Gly											869
					gag Glu											917
					caa Gln 145											965
					atc Ile											1013
					aag Lys											1061
					gaa Glu											1109
					ctt Leu											1157
					ttt Phe 225											1205
					atg Met											1253
					aaa Lys											1301
agc Ser	ccc Pro	gcg Ala 270	aag Lys	ttc Phe	agc Ser	aat Asn	ggc Gly 275	cgt Arg	ttc Phe	gtc Val	cgc Arg	aac Asn 280	ctg Leu	atc Ile	gaa Glu	1349
					cag Gln											1397
tta Leu 300	aag Lys	aat Asn	gac Asp	ttg Leu	ata Ile 305	acc Thr	atc Ile	aaa Lys	agc Ser	cag Gln 310	gat Asp	ctc Leu	gac Asp	ttg Leu	aag Lys 315	1445

	g ccg cac gt a Pro His Va 320		eg ttettttt	t attttcgag	3 9	1493
atttctggca	accgctccct	tcgtttgtta	tgatagtact	gcttattgac	taacgttaag	1553
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atgccagctt	ccgcacgtgt	ctgatgagcg	tttttcatac	tcgatggaag	agctcgccgc	1673
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gctgtcgccc	gatgttttaa	tttttaatga	tgaattgtcg	ccgagtcagc	tgaaagcgct	1853
tgtcacaacg	cttgacgtga	aaatcatcga	ccggacgcag	ttgatccttg	atattttcgc	1913
caaacgcgcg	aggacaaggg	aaggaaagct	gcaaattgag	ct		1955

<210> 99

<211> 321

<212> PRT

<213> Bacillus licheniformis

<400> 99

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Ile Leu Asn Gly Gln Lys Gln Val Leu Ala Asn Ser Glu Ala Glu Ala 20 25 30

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Lys Glu Ile Glu Arg Glu Met Asn Thr Leu Val Gly Met Glu Glu Met 50 55 60

Lys Arg Asn Ile Lys Glu Ile Tyr Ala Trp Ile Phe Val Asn Lys Lys 65 70 75 80

Arg Glu Glu Gln Gly Leu Lys Ala Gly Lys Gln Ala Leu His Met Met 85 90 95

Phe Lys Gly Asn Pro Gly Thr Gly Lys Thr Thr Val Ala Arg Leu Ile 100 105 110

Gly Arg Leu Phe Tyr Glu Met Asn Val Leu Ser Lys Gly His Leu Ile

115 120 125

Glu Ala Glu Arg Ala Asp Leu Val Gly Glu Tyr Ile Gly His Thr Ala 130 135 140

Gln Lys Thr Arg Asp Leu Ile Lys Lys Ala Met Gly Gly Ile Leu Phe 145 150 155 160

Ile Asp Glu Ala Tyr Ser Leu Ala Arg Gly Glu Lys Asp Phe Gly 165 170 175

Lys Glu Ala Ile Asp Thr Leu Val Lys His Met Glu Asp Lys Arg Asn 180 185 190

Glu Phe Ile Leu Ile Leu Ala Gly Tyr Ser Arg Glu Met Asp His Phe 195 200 205

Leu Ser Leu Asn Pro Gly Leu Gln Ser Arg Phe Pro Ile Ser Ile Asp 210 215 220

Phe Pro Asp Tyr Ser Val Ser Gln Leu Met Asp Ile Ala Lys Arg Met 225 230 235 240

Met Ala Glu Arg Glu Tyr Gln Phe Ser Pro Glu Ala Glu Trp Lys Leu 245 250 255

Lys Asp His Leu Met Ala Val Lys Ser Thr Val Ser Pro Ala Lys Phe 260 265 270

Ser Asn Gly Arg Phe Val Arg Asn Leu Ile Glu Lys Ser Ile Arg Ser 275 280 285

Gln Ala Met Arg Leu Leu Met Gly Asp Cys Tyr Leu Lys Asn Asp Leu 290 295 300

Ile Thr Ile Lys Ser Gln Asp Leu Asp Leu Lys Glu Asp Ala Pro His 305 310 315

Val

<210> 100 <211> 2082 <212> DNA

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120

869

aca tac aat ctt gat ccg aaa aaa ata gaa gaa aag atc acc cct gct

Thr Tyr Asn Leu Asp Pro Lys Lys Ile Glu Glu Lys Ile Thr Pro Ala

115

					ccc Pro											917
					ctt Leu 145											965
_	_	_			ttc Phe		_	_						_		1013
					gcc Ala											1061
					ggg Gly											1109
					aca Thr											1157
					ggt Gly 225											1205
_	_				ctt Leu					_						1253
					agc Ser											1301
					gca Ala											1349
					gcg Ala											1397
					cat His 305											1445
_		_	_		tct Ser		_	_					_			1493
					tcc Ser											1541
ttt	cta	gcc	gcc	gag	gaa	caa	gat	cag	att	att	tct	gcg	ctg	ctg	aaa	1589

Phe Leu Ala Ala Glu Glu Gln Asp Gln Ile Ile Ser Ala Leu Leu Lys aaa gga ggg gaa aag tgacggttca ttttggttta atcggctgcg 1637 Lys Gly Gly Glu Lys 365 gctatatgtc aagaaaacat cttcaagcac tggccgagtg cgatgatgca aagttgtcgg 1697 ccgtcagtga tttgcaggaa gaaagaatga aggaagcgga agaatactat gcttccctcg 1757 ccggtgagga aagccgaatg acccgctatc cgcagtatca agcgctgctt tcagatccta 1817 aaattgaagc ggtcattatt gcggcggttt cgggactgca cgccgaaatg gccaaacatg 1877 cgctgctggc aggcaagcac gtcatcgtcg aaaaaccgat gaccttgtca ttacgggatg 1937 ccgatgagct tatagaactg gcggagcaga acgggctgaa gctcatggtc tgccaccaga 1997 tgcgccaccg gccgatcatg aaaaaactga aggaaacgat tgaggaagga aagctgggaa 2057 2082 agatctactt gggcacggta tcgct <210> 101 <211> 369 <212> PRT <213> Bacillus licheniformis <400> 101 Met Ile Pro Leu Val Asn Leu Lys Arg Gln Phe Gln Thr Val Lys Gln 5 Asp Ile Leu Lys Glu Phe Glu His Val Leu Asp Ser Gly Gln Tyr Ile 20 Leu Gly Pro Lys Val Glu Glu Leu Glu Lys Arg Ile Ala Glu Lys Leu 35 Gly Val Lys Glu Ala Val Ala Val Ala Asn Gly Thr Asp Ala Leu Val Leu Thr Leu Glu Ala Phe Gly Ile Gly Lys Gly Asp Glu Val Ile Thr 65 Thr Pro Phe Thr Phe Phe Ala Thr Ala Glu Ala Val Ser Arg Val Gly 90 Ala Glu Pro Val Phe Ala Asp Val Asp Pro Glu Thr Tyr Asn Leu Asp

105

100

Pro Lys Lys Ile Glu Glu Lys Ile Thr Pro Ala Thr Lys Ala Ile Ile Pro Val His Ile Phe Gly Gln Pro Ala Asp Met Asp Glu Ile Met Glu Leu Ala Lys Lys His Gly Leu Leu Val Ile Glu Asp Ala Cys Gln Ala Phe Gly Ala Ser Tyr Lys Glu Arg Pro Val Gly Ser Ile Gly Asp Ala Ala Cys Phe Ser Phe Phe Pro Thr Lys Asn Leu Gly Thr Leu Gly Asp Gly Gly Met Val Thr Ile Ser Asp Pro Asp Ala Ala Arg Gln Leu Arg Thr Leu Arg Thr His Gly Thr Ser Lys Lys Tyr Phe His Asp Lys Ile Gly Phe Asn Ser Arg Leu Asp Glu Leu His Ala Ala Ala Leu Leu Ile Leu Leu Glu Lys Ile Asp Gly Trp Asn Glu Gln Arg Arg Arg Val Ala Ser Arg Tyr Arg Glu Gly Leu Lys Thr Ala Glu His Leu Thr Leu Pro Ala Glu Lys Glu Asp Arg Thr His Ile Tyr His Leu Tyr Cys Ile Gly Ala Lys Asn Arg Asp Tyr Ile Ile Gln Ser Leu Lys Glu Gln Asp Ile His Ser Gly Val Tyr Tyr Pro Cys Cys Leu His Leu Gln Ser Val Tyr Ser Ser Leu Gln Tyr Lys Lys Gly Asp Phe Pro Ile Ala Glu Ser Leu

Ser Glu Thr Leu Phe Ala Ile Pro Met Asp Pro Phe Leu Ala Ala Glu 340 345 350

Glu Gln Asp Gln Ile Ile Ser Ala Leu Leu Lys Lys Gly Gly Glu 355 360 365

Lys

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aacaagcagg tgaacaattg atg agc gat atg aca gag tta tcc ggc cag cat Met Ser Asp Met Thr Glu Leu Ser Gly Gln His 1 5 10	533
att ttc ata act ggc gga gca ggc ttt atc gga tcc tct tta ata gga Ile Phe Ile Thr Gly Gly Ala Gly Phe Ile Gly Ser Ser Leu Ile Gly 15 20 25	581
aag ctg ata gag cgc aac agc gtc acc gta tat gac aat ttt tca aga Lys Leu Ile Glu Arg Asn Ser Val Thr Val Tyr Asp Asn Phe Ser Arg 30 35 40	629
gac tcc ctc cgg tat aag cct tac cgg gac cat cct cac ttg aaa gtg Asp Ser Leu Arg Tyr Lys Pro Tyr Arg Asp His Pro His Leu Lys Val 45 50 55	677
ctg cag gga gac att ttg gat ttg aac gcg ctt aaa aag gcg atc cag	725

Leu 60	Gln	Gly	Asp	Ile	Leu 65	Asp	Leu	Asn	Ala	Leu 70	Lys	Lys	Ala	Ile	Gln 75	
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					gtt Val											821
_		_		_	gcg Ala	_	_				_	_			_	869
_	_		_		agc Ser	_						_				917
_			_		act Thr 145	_						_	-	_		965
		_	_	_	aaa Lys		_				_	_		_		1013
					ctt Leu											1061
					gtc Val											1109
					gag Glu											1157
					tac Tyr 225											1205
					gaa Glu											1253
					acc Thr											1301
					tca Ser											1349
					atc Ile											1397

285			290		2	95		
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gatcctga	ta aacc	cgacag t	accatttt	g ttttcg	ccgc t	tacattcgc	tcctattcat	1852
attgaaga	aa actg	caacat d	gggatcgg	t gcgtct	atcc t	agcaggcgt	tacgataggc	1912
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gca								1975

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<211> 324

<212> PRT

<213> Bacillus licheniformis

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Asn Ser Val Thr Val Tyr Asp Asn Phe Ser Arg Asp Ser Leu Arg Tyr 35 40 45

Lys Pro Tyr Arg Asp His Pro His Leu Lys Val Leu Gln Gly Asp Ile 50 55 60

Leu Asp Leu Asn Ala Leu Lys Lys Ala Ile Gln Gly Ala Ser His Ile 65 70 75 80

Val His Ala Ala Gly Ile Ala Gly Ile Asp Thr Val Ile Gln Asn Pro

85	90	95

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- Ser Glu Val Phe Gly Gln Ile Ala Phe Arg Ala Arg Glu Thr Ser His
- Thr Val Leu Gly Ala Val Gly Glu Ala Arg Trp Thr Tyr Ala Val Ser
- Lys Leu Ala Glu Glu His Met Ala Tyr Ala Tyr Phe Lys Glu Leu Gly
- Leu Pro Thr Val Thr Val Arg Pro Phe Asn Val Tyr Gly Pro Glu Gln
- Val Gly Glu Gly Ala Ile Lys Thr Met Val His Arg Ala Leu Leu Asp
- Glu Pro Ile Tyr Ile His Gly Asp Gly Thr Gln Ile Arg Ala Trp Cys
- Tyr Val Asp Asp Met Ile Asp Gly Ile Leu Arg Cys Leu Thr Met Lys
- Glu Ala Ile Gly Glu Ser Phe Asn Ile Gly Asn Glu Arg Thr Val Ile
- Thr Val Tyr Gly Leu Ala Ser Thr Ile Ile Arg Val Leu Gly Ser Lys
- Ser Gln Ile Phe Phe Gly Glu Lys Lys Glu Ala Asp Ile Glu Leu Arg
- Ile Pro Gln Val Asn Lys Ala Lys Glu Met Leu Gly Phe Ser Ala Lys
- Val Asp Leu Glu Glu Gly Ile Arg Arg Thr Ala Glu Ser Ile Lys Lys

Asn Leu Asp Gln

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aagggttgag aagagaagat ttgattgcgc cggagaagta taatgcggtt gatgaaattg 910 970 aaaaatttaa atcttcccgc gataagaccg cattgatctg ggaagatgaa tcagggcgtc aaqtqtcatq qtcctatqaa aaattqattg aaaaggctta caaaatcggc agcatattga 1030 1090 cccqttctqq actqaaaaaa qqtqacaagc ttatcgtgat gatgccgcgg ataccggaaa 1150 cqtatqccqt qtacatgqcc attttaaaag ctggaatggt ggtcatccca tgttccgaaa tgcttcgggc gaaagacttg gattacagga tcaagcatgc aggcgtcaaa ggagccgtcg 1210 1213 tat <210> 105 <211> 70 <212> PRT <213> Bacillus licheniformis <400> 105 Met Ala Gln Asn Asn Arg Gln Ser Ser Ser Asn Gln Leu Leu Val Pro 10 Gly Ala Ala Gln Ala Ile Asp Gln Met Lys Phe Glu Ile Ala Ser Glu 20 Phe Gly Val Asn Leu Gly Ala Glu Thr Thr Ser Arg Ala Asn Gly Ser Val Gly Gly Glu Ile Thr Lys Arg Leu Val Ser Phe Ala Gln Gln Met Gly Gly Thr Gln Gln <210> 106 <211> 1196 <212> DNA <213> Bacillus licheniformis <220> <221> CDS (501)..(695) <222> <400> 106 cattgtacga gacttaaaat cggtttatga cttcgaaacg atccgtccga tcttaacaac 60

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aatgaaataa tegeegaeeg gegegeetgg ettgeeaatt geeaggegtt tttttgeeet	420
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gca gag cag gtt tta gac cag ttc aaa tac gaa atc gcc caa gag ttc Ala Glu Gln Val Leu Asp Gln Phe Lys Tyr Glu Ile Ala Gln Glu Phe 15 20 25	581
ggc gtc cag ctc ggc tcg gac tcg gtc gct cgc tca aac gga tct gta Gly Val Gln Leu Gly Ser Asp Ser Val Ala Arg Ser Asn Gly Ser Val 30 35 40	629
ggc ggg gaa atg aca aaa cga ctt gta cag cag gca caa gct caa ttg Gly Glu Met Thr Lys Arg Leu Val Gln Gln Ala Gln Ala Gln Leu 45 50 55	677
aat ggg cat aat gac aaa taaataccct atggattatt cgccgggccc Asn Gly His Asn Asp Lys 60 65	725
gctcggcgga tattcttgtt tattcgtttg gtcagaaggc tttttctcct tttggtaagg	785
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<213> Bacillus licheniformis

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ccgg	gcttg	jca c	cgaa	tgac	a go	gatt	attt	ttt	aato	aaa	ccaa	agca	ct c	agco	tttta	180
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														gaa Glu		581
														ccg Pro		629

					gag Glu											677
					att Ile 65											725
					gtt Val											773
cct Pro	cgg Arg	cca Pro	aga Arg 95	cgg Arg	aac Asn	att Ile	gaa Glu	aca Thr 100	aac Asn	gcc Ala	tat Tyr	atc Ile	gaa Glu 105	cct Pro	cgg Arg	821
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gaa Glu	ggc Gly	tgg Trp	ctc Leu	atc Ile 240	tca Ser	acc Thr	gcg Ala	ctt Leu	gct Ala 245	ccg Pro	aaa Lys	acg Thr	aga Arg	gcg Ala 250	gat Asp	1253
cag Gln	ccc Pro	gga Gly	caa Gln 255	tgg Trp	tat Tyr	gaa Glu	gcc Ala	cat His 260	gat Asp	tac Tyr	cgg Arg	gcc Ala	cac His 265	ggc Gly	gaa Glu	1301

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<211> 321

<212> PRT

<213> Bacillus licheniformis

<400> 109

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Glu Val Arg Gln Gly Asp Thr Leu Ala Ser Ile Gly Ala Arg Phe Asn 50 55 60

Ile Ser Pro Ala Glu Leu Ala Arg Ile Asn Arg Ile Gln Val Ser Ala 65 70 75 80

Val Leu Pro Val Gly Leu Leu Tyr Ile Pro Pro Arg Pro Arg Arg 85 90 95

Asn Ile Glu Thr Asn Ala Tyr Ile Glu Pro Arg Gly Glu Ser Val Ser 100 105 110

Pro Ala Leu Gln Gln Ala Ala Arg Glu Ala Ser Pro Tyr Leu Thr Tyr 115 120 125

Leu Gly Ala Phe Ser Phe Gln Ala Lys Arg Asp Gly Thr Leu Glu Glu 130 135 140

Pro Pro Leu Asn Asn Leu Lys Glu Ile Ala Asp Arg His Arg Thr Thr 145 150 155 160

Met Met Met Ile Val Thr Asn Leu Glu Asn Glu Ala Phe Ser Asp Glu 165 170 175

Leu Gly Arg Ile Ile Leu Thr Asp Gln Asn Val Lys Asn Arg Leu Leu 180 185 190

Asp Asn Ile Val Ala Ala Ala Arg Arg Tyr Gly Phe Lys Asp Ile His 195 200 205

Phe Asp Phe Glu Tyr Leu Arg Pro Glu Asp Arg Glu Ala Tyr Asn Gln 210 215 220

Phe Leu Arg Asp Ala Arg Ala Arg Phe Arg Gln Glu Gly Trp Leu Ile 225 230 235 240

Ser Thr Ala Leu Ala Pro Lys Thr Arg Ala Asp Gln Pro Gly Gln Trp
245 250 255

Tyr Glu Ala His Asp Tyr Arg Ala His Gly Glu Ile Val Asp Phe Val 270 Val Leu Met Thr Tyr Glu Trp Gly Tyr Ser Gly Gly Pro Pro Met Ala Val Ser Pro Ile Gly Pro Val Arg Asp Val Ile Glu Tyr Ala Leu Thr 295 Glu Met Pro Ala Ser Lys Ile Val Met Gly Gln Lys Leu Tyr Gly Tyr 315 320 310 305 Asp <210> 110 <211> 2011 <212> DNA <213> Bacillus licheniformis <220> <221> CDS (252)..(1508) <222> <400> 110 gaattggccg aaaacctcca tcgctttatg aaggacgaga gcggtatcaa attctttgct 60 ccttcccaag cccctatcac ctcctttatt tgaaggatac actttctaga ctgttcagtc 120 aagaattatc cgcttcacgg ttctattcac cattccagct gtaaaaaacg gcgcatgatc 180 cttctgcaac ggtcatagac atagcataaa accccctgtc acatacagag gaacaaaagg 240 aagtgtgcca g ttg ttt att tat aca gtc cag ccg gga gat tca cta ttt 290 Leu Phe Ile Tyr Thr Val Gln Pro Gly Asp Ser Leu Phe gtc atc ggc gcc aag ttc gga att tcg att gac cag atc cga ttg gcg 338 Val Ile Gly Ala Lys Phe Gly Ile Ser Ile Asp Gln Ile Arg Leu Ala 15 20 aat ggg ttg atc gca aca aac att gtc ccc gga cag gct ctt tta ata 386 Asn Gly Leu Ile Ala Thr Asn Ile Val Pro Gly Gln Ala Leu Leu Ile 45 30 ccg ctt tat aca tat acc gtt cag ccg gga gac agt tat tac acg att 434 Pro Leu Tyr Thr Tyr Thr Val Gln Pro Gly Asp Ser Tyr Tyr Thr Ile

50

60

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	gta Val															530
gaa Glu	ttg Leu 95	ccg Pro	aaa Lys	aaa Lys	ccg Pro	atc Ile 100	act Thr	gct Ala	tta Leu	gga Gly	tat Tyr 105	tac Tyr	aca Thr	ctg Leu	aga Arg	578
aac Asn 110	ccc Pro	cgg Arg	tta Leu	gac Asp	cag Gln 115	gaa Glu	ttg Leu	att Ile	cat His	aat Asn 120	ttt Phe	gcc Ala	cca Pro	tac Tyr	gcc Ala 125	626
acg Thr	tat Tyr	ctg Leu	gca Ala	ttt Phe 130	ttt Phe	gaa Glu	tac Tyr	cac His	att Ile 135	tca Ser	agc Ser	gac Asp	gga Gly	tcg Ser 140	tta Leu	674
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ccg Pro	tct Ser 175	ctt Leu	gcg Ala	cac His	cgc Arg	gta Val 180	tta Leu	aat Asn	cag Gln	cct Pro	gcc Ala 185	gta Val	aga Arg	aat Asn	cgc Arg	818
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gtc Val	aat Asn	att Ile	gat Asp	ttc Phe 210	gaa Glu	cag Gln	att Ile	ttg Leu	gag Glu 215	gaa Glu	gac Asp	aga Arg	gat Asp	tta Leu 220	ttt Phe	914
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gtg Val	ttg Leu	acg Thr 240	att Ile	gcc Ala	gtt Val	ccg Pro	ccg Pro 245	aaa Lys	aca Thr	aat Asn	gaa Glu	aat Asn 250	atc Ile	gcc Ala	tgg Trp	1010
ctg Leu	aaa Lys 255	ggg Gly	tat Tyr	gac Asp	tat Tyr	ggc Gly 260	gga Gly	atc Ile	ggt Gly	gca Ala	gtg Val 265	agc Ser	gac Asp	ctt Leu	atc Ile	1058
tto Phe 270	atc Ile	atg Met	gca Ala	tac Tyr	gac Asp 275	tgg Trp	cac His	cac His	ggg Gly	aca Thr 280	agc Ser	gag Glu	ccc Pro	ggc Gly	ccc Pro 285	1106
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Ile Ala Pro Ile Asn Glu Val Arg Gln Thr Ile Gln Phe Ala Leu Arg 290 295 300	
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<213> Bacillus licheniformis

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Thr Tyr Thr Val Gln Pro Gly Asp Ser Tyr Tyr Thr Ile Ala Arg Arg 50 55 60

Thr Phe Val Ser Val Glu Ala Leu Gln Lys Ala Asn Pro Ser Val Thr 65 70 75 80

Pro Ser Asn Met Arg Pro Gly Ile Lys Val Met Ile Pro Glu Leu Pro 85 90 95

Lys Lys Pro Ile Thr Ala Leu Gly Tyr Tyr Thr Leu Arg Asn Pro Arg 100 105 110

Leu Asp Gln Glu Leu Ile His Asn Phe Ala Pro Tyr Ala Thr Tyr Leu 115 120 125

Ala Phe Phe Glu Tyr His Ile Ser Ser Asp Gly Ser Leu Ser Glu Leu 130 135 140

Asn Asp Ser Pro Ala Val Gln Thr Ala Trp Arg Arg Arg Val Pro Pro 145 150 155 160

Leu Met Thr Val Thr Asn Leu Thr Glu Ser Gly Phe Ser Pro Ser Leu 165 170 175

Ala His Arg Val Leu Asn Gln Pro Ala Val Arg Asn Arg Leu Ile Asp 180 185 190

Asn Ile Val Gln Thr Ile Ser Arg Lys Gly Tyr Ala Gly Val Asn Ile 195 200 205

Asp Phe Glu Gln Ile Leu Glu Glu Asp Arg Asp Leu Phe Ser Gly Phe 210 215 220

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								gaa Glu								1022
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								ctc Leu								1214
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	Gln							aaa Lys								1502
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Arg Glu Asn Ala Ala Met Lys Gln Gln Leu Gln Gln Leu Ser Phe Glu 50 55 60

Leu Glu Arg Ile Ser Ala Asn Lys Glu Asp Lys Ser Ala Glu Thr Leu 65 70 75 80

Asn Arg Ile Lys Ser Glu Leu Leu Ser Lys Ile Val Val Leu Gln Glu 85 90 95

Leu Leu Gln Lys Glu Thr Tyr Ala Arg Lys Gln Glu Ile Glu Glu Lys
100 105 110

His Arg Leu His Leu Thr Asn Val Lys Ala Glu Glu Lys Lys Ser 115 120 125

Leu His Ser Gln Ile Glu Tyr Glu Lys Leu His Ala Glu Arg Glu Lys 130 135 140

Thr Leu Arg Glu Lys Lys Glu Gln Glu Leu Lys Asn Ala Ala Tyr Glu 145 150 155 160

Asn Ala Arg Leu Lys Asp Glu Leu His Ala Lys Ser Leu Gln Leu Lys Gln Ile Glu Thr Asp Val Ala Val Leu Lys Glu Arg Val Thr Glu Thr 185 Lys Ser Arg Leu Leu Glu Ala Glu Lys Thr Lys Glu Ala Leu Phe Tyr 200 Glu Thr Ile Leu Ser Tyr Lys Arg Gln Leu Asp Glu Ser Asp Lys Trp 210 215 220 Ile Ala Ser His Phe Ala Asp Ile Asp Ala Phe Gln Gln Thr Glu Lys 225 230 235 240 Ala Leu Glu Gln Asn Glu Glu Val Phe Glu Arg Thr Glu Gln Ile Glu 245 250 Ala Val Leu Gln Thr Val Thr Glu Gln Val Asp Gln Leu Gln Gln Gln 260 265 Leu Ser Ala Ile Gln Gln Asn Tyr Thr Lys Met Asp Gln Lys Ile Thr 280 Glu Trp Lys Lys Gln Ala Lys Glu Glu Thr Pro Pro Gln Lys Trp Val Tyr Gln Ile Lys Arg Lys Asp Lys Glu Thr Lys Pro Leu Asn 305 310 315 <210> 114 <211> 2341 <212> DNA <213> Bacillus licheniformis <220> <221> CDS <222> (501)..(1838) <400> 114 aagcgaaagg cgagtcattt gaaggaaaag tggctgtcgc caatgtcgtc ctgaatcggg 60 tgaaagacag ccgatttcct gacagcgtaa aaagcgtgat ctatcaaaga aacgcttttg

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					atc Ile 225											1205
					gaa Glu											1253
					aca Thr											1301
	_		_		atc Ile				_	_			_			1349
					atc Ile											1397
					atc Ile 305											1445
					ccg Pro											1493
					ttt Phe											1541
					tat Tyr											1589
					gga Gly											1637
					gtc Val 385											1685
tcc Ser	atg Met	cag Gln	act Thr	ttg Leu	cag Gln	atg Met	acg Thr	ggg ggg	atc Ile	att Ile	ctt Leu	gcg Ala	atg Met	aat Asn	acc Thr	1733

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Phe Leu Val Val Val Ile Ala Ser Leu Glu Le 50 55	1 Pro Val Ser Ile Ser 60													
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1374

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His Asp Leu Thr Tyr Gln Val Asp Gln Leu His Asp Lys Ile Gly Ser
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                                                                      240
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Phe Leu Tyr Ile Pro Leu Ser Asp Val His Ala Phe Arg Lys Val Ile
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95
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Ile Asp Ile Thr Gly Ala Asn Pro Glu Thr Glu His Gln Ile Arg Gln
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Gln Leu Asp Gln Ile Gly Val Lys Lys Gly Arg Phe Gln Phe Ser Met
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	gc gag ly Glu													914
_	tc gtt eu Val 225	Ser	 _			_	_		_	_			_	962
Gly A	ca aaa la Lys 40													1010
	tt cct al Pro													1058
	gt cac er His													1106
	ca ttt er Phe		_	_		_	_	_	_	_			_	1154
	ac tcg is Ser 305	Leu					_							1202
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Tyr Ile Pro Leu Ser Asp Val His Ala Phe Arg Lys Val Ile Arg Gly 50 55 60

Phe Asp Cys Lys Cys Arg Phe Ile Lys Arg Lys Gly Phe Pro Phe Leu 70 75 80

Val Gln Lys Ser Lys Arg Asn Ser Gly Phe Thr Phe Gly Val Ala Ala 85 90 95

Phe Phe Ile Ile Met Phe Leu Leu Ser Asn Met Leu Trp Lys Ile Asp 100 105 110

Ile Thr Gly Ala Asn Pro Glu Thr Glu His Gln Ile Arg Gln Gln Leu 115 120 125

Asp Gln Ile Gly Val Lys Lys Gly Arg Phe Gln Phe Ser Met Leu Thr 130 135 140

Pro Glu Lys Ile Gln Gln Ala Leu Thr Lys Arg Val Glu Asn Ile Thr 145 150 155 160

Trp Val Gly Ile Glu Leu Asn Gly Thr Ala Leu His Met Lys Val Val 165 170 175

Glu Lys Asn Glu Pro Asp Lys Glu Lys Tyr Ile Gly Pro Arg His Ile 180 185 190 Val Ala Lys Lys Gly Ala Thr Ile Ser Lys Met Phe Val Glu Lys Gly 200 195 Glu Pro Leu Val Thr Val Asn Gln His Val Glu Lys Gly Gln Met Leu Val Ser Gly Leu Ile Gly Ser Glu Glu Lys Gln Lys Val Gly Ala 230 Lys Gly Lys Ile Tyr Gly Glu Thr Trp Tyr Lys Ser Thr Val Thr Val 245 250 Pro Leu Glu Thr Ser Phe Asp Val Phe Thr Gly Lys Val Arg Thr Ser 260 265 His Lys Leu Ser Leu Gly Ser Leu Thr Met Pro Ile Trp Gly Phe Ser 275 280 Phe Lys Lys Glu Asp Phe Ser Arg Pro Lys Thr Glu Thr Glu Lys His 295 290 Ser Leu His Phe Ile Asn Phe Lys Leu Pro Val Ala Tyr Glu Lys Glu 315 320 310 305 His Met Arg Glu Ser Glu Gln Ile Lys Arg Val Tyr Ser Lys Lys Glu 330 Ala Val Leu Arq Arq Asn Arg Asn Gly Lys Lys Arg His Gln Asp Lys 345 Asn Arg Gln Arg Arg Glu His Tyr Gln Cys Lys Ser Phe Ala His His 355 Glu <210> 122 <211> 2120 <212> DNA <213> Bacillus licheniformis <220>

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His Ala Gly Lys Asn Val Gln Ala Ala Glu Thr Tyr Glu Gln Leu Gln 50 60

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Thr Glu Cys Phe Pro Phe Val Thr Ser Arg Ile Ile Gly Arg Ser Ser 100 105 110

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Ile	Asp	Ser	Tyr	Ala 325	Gly	Phe	Arg	Asp	Trp 330	Phe	Ile	His	Tyr	Tyr 335	Gly
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Leu Lys Gln Phe Asp Asp Ile Tyr Cys Lys Ser Arg Gly Ile Leu Trp

360

355

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gcg gat atc gat gtc cgt gat att tta gag gaa gac gat gca gtg atc Ala Asp Ile Asp Val Arg Asp Ile Leu Glu Glu Asp Asp Ala Val Ile 170 175 180	884
gtc tat gcc gag ccc gat cag ttc cac gcc gta cag gag gcg ctg caa Val Tyr Ala Glu Pro Asp Gln Phe His Ala Val Gln Glu Ala Leu Gln 185 190 195	932
aac gcc ggc att act gag ttc acg gtg gcc gag ctg acg atg ctc gcg Asn Ala Gly Ile Thr Glu Phe Thr Val Ala Glu Leu Thr Met Leu Ala 200 205 210	980
caa aat gac gtc gcc ctt cca gag gac gcg cgc gca cag ttt gaa aag Gln Asn Asp Val Ala Leu Pro Glu Asp Ala Arg Ala Gln Phe Glu Lys 215 220 225	1028
ctg att gac gcg ctg gaa gat ctg gaa gac gtt cag caa gtt tac cat Leu Ile Asp Ala Leu Glu Asp Leu Glu Asp Val Gln Gln Val Tyr His 230 235 240 245	1076
aat gtc gat tta ggg gcg taaaaagagg ccctgaaaaa atcgggaaag Asn Val Asp Leu Gly Ala 250	1124
aaaagataga tgaacaggag gacgacctgt tttgtctatc tttttttatt gtaaagttaa	1184
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gatttattta tttttgaggg ggatgaaaat attgactgaa acgatgacaa acatactgat	1484
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<211> 251

<212> PRT

<213> Bacillus licheniformis

<400> 125

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Trp Asn Asn Ile Lys Glu Lys Lys Ala Ser Lys Asp Ala Asn Thr Ser 20 25 30

Arg Ile Tyr Ala Lys Phe Gly Arg Glu Ile Tyr Val Ala Ala Lys Gln 35 40 45

Gly Glu Pro Asp Pro Glu Leu Asn Gln Asn Leu Lys Phe Val Leu Glu 50 55 60

Arg Ala Lys Thr Tyr Asn Val Pro Lys Ala Ile Ile Glu Arg Ala Ile 65 70 75 80

Glu Lys Ala Lys Gly Gly Ser Glu Glu Asn Tyr Asp Glu Leu Arg Tyr 85 90 95

Glu Gly Phe Gly Pro Asn Gly Ala Met Val Ile Val Asp Ala Leu Thr 100 105 110

Asn Asn Val Asn Arg Thr Ala Ala Asp Val Arg Ser Thr Phe Gly Lys 115 120 125

Asn Gly Gly Asn Met Gly Val Ser Gly Ser Val Ala Tyr Met Phe Asp 130 135 140

Pro Thr Ala Val Ile Gly Phe Glu Gly Lys Thr Ala Asp Glu Thr Leu 145 150 155 160

Glu Leu Leu Met Glu Ala Asp Ile Asp Val Arg Asp Ile Leu Glu Glu 165 170 175

Asp Asp Ala Val Ile Val Tyr Ala Glu Pro Asp Gln Phe His Ala Val 180 185 190

Gln Glu Ala Leu Gln Asn Ala Gly Ile Thr Glu Phe Thr Val Ala Glu 195 200 205

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Leu Thr Met Leu Ala Gln Asn Asp Val Ala Leu Pro Glu Asp Ala Arg

115

										aga Arg						431
										gat Asp						479
atg Met 160	ttt Phe	aaa Lys	gag Glu	ctg Leu	ttc Phe 165	agc Ser	tat Tyr	gcc Ala	gcc Ala	cct Pro 170	tat Tyr	gtc Val	ttt Phe	gtc Val	999 Gly 175	527
										acg Thr						575
										agc Ser						623
										atg Met						671
										gcg Ala						719
acc Thr 240	aac Asn	aaa Lys	gat Asp	ttc Phe	cct Pro 245	gct Ala	tta Leu	aac Asn	aaa Lys	cag Gln 250	att Ile	gat Asp	cag Gln	gcg Ala	atg Met 255	767
cag Gln	atc Ile	att Ile	ctc Leu	ttc Phe 260	atc Ile	gtt Val	ctt Leu	ccg Pro	gca Ala 265	tca Ser	gtc Val	ggt Gly	atg Met	gct Ala 270	ctt Leu	815
										ggc Gly						863
cct Pro	gac Asp	atg Met 290	gga Gly	cga Arg	gat Asp	att Ile	ttg Leu 295	ttc Phe	tgg Trp	tac Tyr	gcg Ala	cct Pro 300	gtg Val	gcg Ala	ctg Leu	911
tta Leu	ttc Phe 305	tcg Ser	ctc Leu	ttc Phe	acc Thr	gtc Val 310	aac Asn	gct Ala	gca Ala	att Ile	ttg Leu 315	cag Gln	ggg Gly	gtg Val	aac Asn	959
aag Lys 320	cag Gln	aaa Lys	ttt Phe	gcg Ala	gtt Val 325	gtc Val	agc Ser	ttg Leu	atg Met	atc Ile 330	ggg Gly	att Ile	gtg Val	atc Ile	aaa Lys 335	1007
atc Ile	gcg Ala	ctt Leu	aac Asn	gtt Val 340	ccg Pro	ctc Leu	atc Ile	aag Lys	ctg Leu 345	ctt Leu	caa Gln	ggc Gly	agc Ser	ggg Gly 350	tcg Ser	1055
att	ttg	gca	acg	gcg	ctc	ggc	tat	tca	gct	tca	ctc	cta	tac	gga	ttt	1103

Ile Leu Ala Thr Ala Leu Gly Tyr Ser Ala Ser 355 360	Leu Leu Tyr Gly Phe 365
atc atg att aaa cgc cat gcc ggc tat tcg tat Ile Met Ile Lys Arg His Ala Gly Tyr Ser Tyr 370 375	
cgg ttt ttg ctg atg ctg atc ctg acg gcg gtc Arg Phe Leu Leu Met Leu Ile Leu Thr Ala Val 385 390	
ctg ctt gtc cag gcg ctt cta agt att ttt att Leu Leu Val Gln Ala Leu Leu Ser Ile Phe Ile 400 405 410	Ser Tyr Glu Gly Gly
cag atc agg tct gct gtc gtc att ttc atc aca Gln Ile Arg Ser Ala Val Val Ile Phe Ile Thr 420 425	
tca gtt tat ctg tac ttg gct tac cgt gtg aaa Ser Val Tyr Leu Tyr Leu Ala Tyr Arg Val Lys 435 440	
ttc ggt cag cga ttg aat cgc ttt ttc aaa aga Phe Gly Gln Arg Leu Asn Arg Phe Phe Lys Arg 450 455	
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ttgtcaaaca gcggctatgg ttcgagaaaa gaagtcaaaa	aaatgctgaa aaacggcgcg 1505
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<212> PRT <213> Bacillus licheniformis

<400> 127

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Asn Lys Asp Phe Pro Ala Leu Asn Lys Gln Ile Asp Gln Ala Met Gln

245 250 255

Ile Ile Leu Phe Ile Val Leu Pro Ala Ser Val Gly Met Ala Leu Leu 260 265 270

Ser Gly Pro Val Tyr Thr Phe Phe Tyr Gly Ser Glu Ser Leu Leu Pro 275 280 285

Asp Met Gly Arg Asp Ile Leu Phe Trp Tyr Ala Pro Val Ala Leu Leu 290 295 300

Phe Ser Leu Phe Thr Val Asn Ala Ala Ile Leu Gln Gly Val Asn Lys 305 310 315 320

Gln Lys Phe Ala Val Val Ser Leu Met Ile Gly Ile Val Ile Lys Ile 325 330 335

Ala Leu Asn Val Pro Leu Ile Lys Leu Leu Gln Gly Ser Gly Ser Ile 340 345 350

Leu Ala Thr Ala Leu Gly Tyr Ser Ala Ser Leu Leu Tyr Gly Phe Ile 355' 360 365

Met Ile Lys Arg His Ala Gly Tyr Ser Tyr Arg Lys Leu Phe Lys Arg 370 375 380

Phe Leu Leu Met Leu Ile Leu Thr Ala Val Met Gly Ile Ile Leu Leu 385 390 395 400

Leu Val Gl
n Ala Leu Leu Ser Ile Phe Ile Ser Tyr Glu Gly Gl
n 405 410 415

Ile Arg Ser Ala Val Val Ile Phe Ile Thr Thr Ala Val Gly Gly Ser 420 425 430

Val Tyr Leu Tyr Leu Ala Tyr Arg Val Lys Leu Leu Glu Lys Ile Phe 435 440 445

Gly Gln Arg Leu Asn Arg Phe Phe Lys Arg Lys Ala Ser 450 455 460

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120

869

ttt tca gat aca gag acc gct tct gtc gct ctt atc gaa aac ctt cag

Phe Ser Asp Thr Glu Thr Ala Ser Val Ala Leu Ile Glu Asn Leu Gln

115

agg gaa gaa tta tct tcg att gaa gag gcg cat gct tat gca agg ctt Arg Glu Glu Leu Ser Ser Ile Glu Glu Ala His Ala Tyr Ala Arg Leu 125 130 135	917
tta gag ctt cac gat ttg acg cag gaa gcc ctt gca caa agg ctt gga Leu Glu Leu His Asp Leu Thr Gln Glu Ala Leu Ala Gln Arg Leu Gly 140 145 150 155	965
aag ggc cag tca aca atc gcc aat aag ctc aga ctg tta aag ctt ccg Lys Gly Gln Ser Thr Ile Ala Asn Lys Leu Arg Leu Leu Lys Leu Pro 160 165 170	1013
gaa gag gtg cag gaa gcg atc ttg aaa aaa gaa att tca gag cgc cac Glu Glu Val Gln Glu Ala Ile Leu Lys Lys Glu Ile Ser Glu Arg His 175 180 185	1061
gca aga gcg ctc ata ccg ttg aaa cag ccc gac ctt cag gtc aag ctg Ala Arg Ala Leu Ile Pro Leu Lys Gln Pro Asp Leu Gln Val Lys Leu 190 195 200	1109
ctg cat gaa gtc att gaa aag agt tta aat gta aaa caa acc gaa gac Leu His Glu Val Ile Glu Lys Ser Leu Asn Val Lys Gln Thr Glu Asp 205 210 215	1157
cgt gtc gtc aaa atg ctt gag cag gat aaa cgc aag cct aaa cca aag Arg Val Val Lys Met Leu Glu Gln Asp Lys Arg Lys Pro Lys Pro Lys 225 230 235	1205
aga aaa gcg tac agc agg gac gcg aga atc gcg atg aat acg att cgc Arg Lys Ala Tyr Ser Arg Asp Ala Arg Ile Ala Met Asn Thr Ile Arg 240 245 250	1253
cag tcc tta tca atg gtg gaa gac agc ggc gtc aaa ctg aat acg gaa Gln Ser Leu Ser Met Val Glu Asp Ser Gly Val Lys Leu Asn Thr Glu 255 260 265	1301
gaa gag gaa ttt gaa gaa tat att cag ttt acg att cga ata ccg aaa Glu Glu Glu Phe Glu Glu Tyr Ile Gln Phe Thr Ile Arg Ile Pro Lys 270 275 280	1349
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<211> 283

<212> PRT

<213> Bacillus licheniformis

<400> 129

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Ile Pro Val Gly Asp Ile Ile Pro Asn Arg Phe Gln Pro Arg Thr Ile 35 40 45

Phe Ser Glu Glu Lys Ile Lys Glu Leu Ala Ala Thr Ile His Thr His 50 55 60

Gly Ile Ile Gln Pro Ile Val Val Arg Lys Thr Glu Arg Glu Gly Gln 65 70 75 80

Tyr Glu Leu Ile Ala Gly Glu Arg Arg Trp Arg Ala Val Gln Thr Leu 85 90 95

Asp Trp Glu Lys Val Pro Ala Ile Ile Lys Asp Phe Ser Asp Thr Glu 100 105 110

Thr Ala Ser Val Ala Leu Ile Glu Asn Leu Gln Arg Glu Glu Leu Ser 115 120 125

Ser Ile Glu Glu Ala His Ala Tyr Ala Arg Leu Leu Glu Leu His Asp 130 135 140

Leu Thr Gln Glu Ala Leu Ala Gln Arg Leu Gly Lys Gly Gln Ser Thr 145 150 155 160

Ile Ala Asn Lys Leu Arg Leu Leu Lys Leu Pro Glu Glu Val Gln Glu 165 170 175

Ala Ile Leu Lys Lys Glu Ile Ser Glu Arg His Ala Arg Ala Leu Ile 180 185 190

Pro Leu Lys Gln Pro Asp Leu Gln Val Lys Leu His Glu Val Ile 195 200 Glu Lys Ser Leu Asn Val Lys Gln Thr Glu Asp Arg Val Val Lys Met Leu Glu Gln Asp Lys Arg Lys Pro Lys Pro Lys Arg Lys Ala Tyr Ser Arg Asp Ala Arg Ile Ala Met Asn Thr Ile Arg Gln Ser Leu Ser Met 245 250 Val Glu Asp Ser Gly Val Lys Leu Asn Thr Glu Glu Glu Glu Phe Glu 260 265 Glu Tyr Ile Gln Phe Thr Ile Arg Ile Pro Lys 275 280 <210> 130 <211> 1495 <212> DNA <213> Bacillus licheniformis <220> <221> CDS <222> (501)..(995) <400> 130 gcagacctga ctacgaaggc atcctgtcaa agctgagcaa aaaagccttt tcgattttgc 60 tegtecatga geetgatgee getttaaegg caaatcaata eecegteaat etgeaaatat 120 coggacacac coacgogog acaaattcag attootgtat toggtoottt gattacgoot 180 ccgtacgtag acgtttatac gcaaggaatg tatgcaacag ccggaatgaa aatttatgtc 240 atttgaggaa tcggcacgag caggctgccg ctccgctttc tgtcaaagcc tgaaatcacc 300 gtgttccagc ttgaatccat ttaatcttgc ccggtccttt ggctcaaaac aaaaggcatc 360 tgcatacatt aagtaaaaac attcccgctc catttcatcc aatcccatca aaaaaacgga 420 acticctcag cctcttccgt ctatatatta gcagcggaaa aggctctctt ttcgtttttg 480 aaaaggagat gtgctgatta ttg ctg atg tac caa gtc aaa ccc gga gga acc 533 Leu Leu Met Tyr Gln Val Lys Pro Gly Gly Thr 10 581 ctt gaa agc atc gcc gcc gat ttc aga acg acc cgg cag gcg ttg ctg

Leu Glu Ser Ile Ala Ala Asp Phe Arg Thr Thr Arg Gln Ala Leu Leu

			tcc gcg ggc cag tcg Ser Ala Gly Gln Ser 40	629
att atc att ccc ggc Ile Ile Ile Pro Gly 45	atc aga aat Ile Arg Asn 50	ccg gac aca Pro Asp Thr	att cca tac cgg att Ile Pro Tyr Arg Ile 55	677
			tat gag cga gac aga Tyr Glu Arg Asp Arg 75	725
ctt gta aaa aca tat Leu Val Lys Thr Tyr 80	ccg att gcc Pro Ile Ala	gtc gga aaa Val Gly Lys 85	atc ctc aca cag acg Ile Leu Thr Gln Thr 90	773
ccg aga ggc gaa ttt Pro Arg Gly Glu Phe 95	gtc atc gtc Val Ile Val	aac cgg cag Asn Arg Gln 100	cca aat ccg ggc ggc Pro Asn Pro Gly Gly 105	821
ccg ttc ggc gcc tac Pro Phe Gly Ala Tyr 110	tgg ctg agc Trp Leu Ser 115	ctg tca aaa Leu Ser Lys	cag cac tac ggc atc Gln His Tyr Gly Ile 120	869
cat gga acg aat aac His Gly Thr Asn Asn 125	cct tcg tca Pro Ser Ser 130	att ggc aaa Ile Gly Lys	gct gtt tca agg gga Ala Val Ser Arg Gly 135	917
tgt atc cgc atg cac Cys Ile Arg Met His 140	aat cgg gat Asn Arg Asp 145	gtt ctg gaa Val Leu Glu 150	ctt gct tct atc gta Leu Ala Ser Ile Val 155	965
ccc aac gga acc cga Pro Asn Gly Thr Arg 160			acgagta catttccaga	1015
caaatgcaat ttgaacaa	ta caacatctt	g tattaagata	taatgggacc tttagggtaa	1075
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<210> 131 <211> 165 <212> PRT

<213> Bacillus licheniformis

<400> 131

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Leu Asn Gly Gly Gln Val Ser Ala Gly Gln Ser Ile Ile Ile Pro Gly 35 40 45

Ile Arg Asn Pro Asp Thr Ile Pro Tyr Arg Ile Ala Val Ser Leu Asn 50 55 60

Gly Arg Thr Leu Arg Leu Tyr Glu Arg Asp Arg Leu Val Lys Thr Tyr 65 70 75 80

Pro Ile Ala Val Gly Lys Ile Leu Thr Gln Thr Pro Arg Gly Glu Phe 85 90 95

Val Ile Val Asn Arg Gln Pro Asn Pro Gly Gly Pro Phe Gly Ala Tyr 100 105 110

Trp Leu Ser Leu Ser Lys Gln His Tyr Gly Ile His Gly Thr Asn Asn 115 120 125

Pro Ser Ser Ile Gly Lys Ala Val Ser Arg Gly Cys Ile Arg Met His 130 135 140

Asn Arg Asp Val Leu Glu Leu Ala Ser Ile Val Pro Asn Gly Thr Arg 145 150 155 160

Val Ser Ile Thr Pro 165

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<211> 1897

<212> DNA

<213> Bacillus licheniformis

<220>

<221> CDS

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cggctgtggc cgttcaagat gctgcctttt tctttcaagt cgtaaaagca agctttgcac	180
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ggc gat atg gtc gtc aga aaa tct tat cga aga gat att tta ttt cga Gly Asp Met Val Val Arg Lys Ser Tyr Arg Arg Asp Ile Leu Phe Arg 15 20 25	581
att ata aga att gat caa tcg gca aat gga gaa cct gta gcc gtt ttg Ile Ile Arg Ile Asp Gln Ser Ala Asn Gly Glu Pro Val Ala Val Leu 30 35 40	629
cac gga gat gag gtc aga tta atc gct gac gcg cat ttg ggg gat ctt His Gly Asp Glu Val Arg Leu Ile Ala Asp Ala His Leu Gly Asp Leu 45 50 55	677
gag att gtc cgc gag gct gag tgg cag atg aga aag cgg gaa gaa gaa Glu Ile Val Arg Glu Ala Glu Trp Gln Met Arg Lys Arg Glu Glu Glu 60 65 70 75	725
acg aga atg aag gaa tcc ctc gat ctt ctc cgc cag gat tac aaa ctc Thr Arg Met Lys Glu Ser Leu Asp Leu Leu Arg Gln Asp Tyr Lys Leu 80 85 90	773
ctt cac gat aaa cat gag tac cgc gcc aca aac caa tat aac aat caa Leu His Asp Lys His Glu Tyr Arg Ala Thr Asn Gln Tyr Asn Asn Gln 95 100 105	821
cag cag tac ttt cat atg ccc gga aga gtc ctt cat tta gac ggg gat Gln Gln Tyr Phe His Met Pro Gly Arg Val Leu His Leu Asp Gly Asp 110 115 120	869
tcg gct tat ttg aaa aag tgt ctg gcg ctc tac gaa aag atc ggg gtt Ser Ala Tyr Leu Lys Lys Cys Leu Ala Leu Tyr Glu Lys Ile Gly Val 125 130 135	917
cct gta tac ggc att cat tgc tat gaa aag aaa atg tca tca gtc atc Pro Val Tyr Gly Ile His Cys Tyr Glu Lys Lys Met Ser Ser Val Ile	965

140 145 150	155
gag gaa ctg atc gat gaa tac cgc ccg gat ctt ctc gtc att Glu Glu Leu Ile Asp Glu Tyr Arg Pro Asp Leu Leu Val Ile 160 165	
cac gat gcc tat tct aag cag aag ggc gat att aac aat ctg His Asp Ala Tyr Ser Lys Gln Lys Gly Asp Ile Asn Asn Leu 175 180 185	
tac agg cat tca aaa gat ttt atc gaa acc gtt caa aaa gcg Tyr Arg His Ser Lys Asp Phe Ile Glu Thr Val Gln Lys Ala 190 195 200	-
aaa att ccc cat ctt gat cag ctc gtc att ttt gcc ggc gca Lys Ile Pro His Leu Asp Gln Leu Val Ile Phe Ala Gly Ala 205 210 215	
tcc cat ttt gaa tca ctg atc aga gcc ggt gca aat ttc gca Ser His Phe Glu Ser Leu Ile Arg Ala Gly Ala Asn Phe Ala 220 225 230	
ccg tcc aga gtc aac atc cat gcg ctt gat ccg gtc tat ata Pro Ser Arg Val Asn Ile His Ala Leu Asp Pro Val Tyr Ile 240 245	-
aaa atc agc ttc act ccg ttt atg gac cgc att aac gtc tggLys Ile Ser Phe Thr Pro Phe Met Asp Arg Ile Asn Val Trp255260	
ctc aga aat acc ttg acg aga gaa aag ggg ctc gga ggt att Leu Arg Asn Thr Leu Thr Arg Glu Lys Gly Leu Gly Gly Ile 270 275 280	
cgg ggc gta ttg cgt att gga atg cca tat aaa aca aaa gca Arg Gly Val Leu Arg Ile Gly Met Pro Tyr Lys Thr Lys Ala 285 290 295	-
taaacgagcc cgccggatgg cgggtttttg ctatgcacac gaaatgtttt t	acctttttt 1457
ttaaaaacat acataatgaa acgaaaatg aggaaaataa gggaaagtcg g	gcgtataatt 1517
tgtcacaaat attttattga cagaggctta tgaacgttga tataatttaa a	attttatttg 1577
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acggtggccg ccgaaaaacg attgagcgtt cgggcatttt agctgagacg t	accettetg 1757
tttttgtgat acaactagac caagacgaga attcgtttga aagagtttca t	acagttatg 1817
cggatattct tactgagacg gttgaattga ggttttccga tgataaaacc a	agctcagtag 1877
ccctttaata agcagtggac	1897

<210> 133

<211> 299

<212> PRT

<213> Bacillus licheniformis

<400> 133

Met Cys Gly Val Lys Ser Met Gln Phe Lys Ile Gly Asp Met Val Val 1 5 10 15

Arg Lys Ser Tyr Arg Arg Asp Ile Leu Phe Arg Ile Ile Arg Ile Asp 20 25 . 30

Gln Ser Ala Asn Gly Glu Pro Val Ala Val Leu His Gly Asp Glu Val 35 40 45

Arg Leu Ile Ala Asp Ala His Leu Gly Asp Leu Glu Ile Val Arg Glu 50 55 60

Ala Glu Trp Gln Met Arg Lys Arg Glu Glu Glu Thr Arg Met Lys Glu 65 70 75 80

Ser Leu Asp Leu Leu Arg Gln Asp Tyr Lys Leu Leu His Asp Lys His
85 90 95

Glu Tyr Arg Ala Thr Asn Gln Tyr Asn Asn Gln Gln Gln Tyr Phe His 100 \$105\$

Met Pro Gly Arg Val Leu His Leu Asp Gly Asp Ser Ala Tyr Leu Lys 115 120 125

Lys Cys Leu Ala Leu Tyr Glu Lys Ile Gly Val Pro Val Tyr Gly Ile 130 135 140

His Cys Tyr Glu Lys Lys Met Ser Ser Val Ile Glu Glu Leu Ile Asp 145 150 155 160

Glu Tyr Arg Pro Asp Leu Leu Val Ile Thr Gly His Asp Ala Tyr Ser 165 170 175

Lys Gln Lys Gly Asp Ile Asn Asn Leu Asp Ala Tyr Arg His Ser Lys 180 185 190

Asp Phe Ile Glu Thr Val Gln Lys Ala Arg Arg Lys Ile Pro His Leu 195 200 205

Asp Gln Leu Val Ile Phe Ala Gly Ala Cys Gln Ser His Phe Glu Ser 210 Leu Ile Arg Ala Gly Ala Asn Phe Ala Ser Ser Pro Ser Arg Val Asn Ile His Ala Leu Asp Pro Val Tyr Ile Val Ala Lys Ile Ser Phe Thr Pro Phe Met Asp Arg Ile Asn Val Trp Glu Val Leu Arg Asn Thr Leu 260 265 Thr Arg Glu Lys Gly Leu Gly Gly Ile Glu Thr Arg Gly Val Leu Arg 275 285 Ile Gly Met Pro Tyr Lys Thr Lys Ala Asn Asp 290 <210> 134 <211> 1010 <212> DNA <213> Bacillus licheniformis <220> <221> CDS <222> (501)..(734) <400> 134 atcattaaag atatcgtgct ggggacgatg tcgaaaaaga atatggaaqa aaagctggga 60 ttataaaaaa tcccggcttt tttgcttata ttgcccaaaa aatggtgaaa atgaaaacaa 120 gctggaggtg attcaacatg aaaaaagcga aaaggcgaac atttgaagaa cttgtctcgg 180 aaaataaaaa ggagctcatg accaaccagg agtttcttga tcggctggaa gataagcttg 240 aagagaaatt taagctgaag tgagttttta aaaatcgatt catgtttacg ctcctttttg 300 agaatcctaa tgctgaaaag gagggataga catgccgaga gaacacgaca aacagtctaa 360 atttgccccg agccatcttg ggacaaaacc ggtagaatat aagcgcaaca aaggaaaaaa 420 gatgcatgat aaatcaggag aaacaccgat cattatgcag acaaaaggcg agtaaagatg 480 aaaaggaqqc agaqacccqa atq aca cat caa aaa cat cat ccq qat qac aqa 533 Met Thr His Gln Lys His His Pro Asp Asp Arg

15	gaa aag ctt Glu Lys Leu	caa gac atg gtg Gln Asp Met Val 20	cag aac aca atc gaa Gln Asn Thr Ile Glu 25	581							
aac att gag gag Asn Ile Glu Glu 30	tct gaa gag Ser Glu Glu	cag ctg tct ttt Gln Leu Ser Phe 35	gcc agc gag gcg gaa Ala Ser Glu Ala Glu 40	629							
cag gaa cag atc Gln Glu Gln Ile 45	cgc gaa aaa Arg Glu Lys 50	aat gaa cgc cga Asn Glu Arg Arg	aat gaa agc att gag Asn Glu Ser Ile Glu 55	677							
gcg atg cgc aat Ala Met Arg Asn 60	gaa atc cat Glu Ile His 65	gac gag gcg gaa Asp Glu Ala Glu 70	gcc cgc aaa aac gga Ala Arg Lys Asn Gly 75	725							
tat cat caa taa Tyr His Gln	accaggg cgacc	tggtt tttttgcato	g aagcccgtcc	774							
gtcgtgtttt tgcc	cattgt atatgo	taga attggattaa	atacatttgt ggaaaaggga	834							
gtagagggga aatt	tgtacg tctcaa	aaaa agaaatagaa	gtccgctatg ccgaaacaga	894							
cccaaaatgg ggtg	tcgtct atcacg	ccaa ttatttgatt	ttgggatggg aggtaagccc	954							
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<210> 136

<211> 2407 <212> DNA <213> Bacillus licheniformis <220> <221> CDS (501)..(1907) <222> <400> 136 gcatactgta aaaggccggg tgaatgaaga gcttttgaaa tcggtcgtga tagatccaaa 60 tggcgaattt tatgtatgcg gtccgctttc atttatgaaa agcgtgattg aaggattgca 120 aaaccttggc gtttcgatgg aaaacatccg ctatgagagc tttgcttcat ctcttgatat 180 gcaaatagcg aactaacctc aagaaggcag ctgtcaaacc gacagctgcc tcagcgtgtc 240 gacaaaccct cgcatgcgtt gtcagtcctg cgcgtcggtg ctcacgaatt ccaacattcg 300 360 ctccqctccq atgctcqqcc ttcctagact gcaagggttt tcaatcacgc tgaaagaagg 420 atgacaaaat cccaaaacta agagctgttt tgggattttg tcagcaatct aaggcagctg 480 tcaatccgac agctgccttt catcttttca aaacccggct catacaataa agagaagtcc aaccgggggg gatttgagta ttg agc ata cgg gag caa aaa gag ctg cag cgg 533 Leu Ser Ile Arg Glu Gln Lys Glu Leu Gln Arg 581 gcg att gaa gaa att acg gaa atc gcg gaa gga ttc ggc ctt gat ttt Ala Ile Glu Glu Ile Thr Glu Ile Ala Glu Gly Phe Gly Leu Asp Phe 15 629 tac ccg atg aga tat gag att tgt cct gct gaa att att tat aca ttc Tyr Pro Met Arg Tyr Glu Ile Cys Pro Ala Glu Ile Ile Tyr Thr Phe 30 677 ggt gca tac ggg atg ccg aca aga tac agc cat tgg agt ttc gga aag Gly Ala Tyr Gly Met Pro Thr Arg Tyr Ser His Trp Ser Phe Gly Lys 45 caa ttt cac aaa atg aag ctt cac tat gac ttt ggc ttg agc aaa ata 725 Gln Phe His Lys Met Lys Leu His Tyr Asp Phe Gly Leu Ser Lys Ile 75 60 65 773 tat gag ctt gtc att aat tca gat ccg tgt tat gcg ttt ttg ctg gac Tyr Glu Leu Val Ile Asn Ser Asp Pro Cys Tyr Ala Phe Leu Leu Asp agc aat tca ttg att caa aat aag ctg att gtc gca cac gtc ctt gct 821 Ser Asn Ser Leu Ile Gln Asn Lys Leu Ile Val Ala His Val Leu Ala 95 cat tgt gat ttc ttt aaa aat aac tgc cgt ttt caa aat acg aag cgc 869 His Cys Asp Phe Phe Lys Asn Asn Cys Arg Phe Gln Asn Thr Lys Arg

115

110

gat Asp	atg Met 125	gtt Val	gaa Glu	agc Ser	atg Met	tcg Ser 130	gcg Ala	aca Thr	gca Ala	gag Glu	cgg Arg 135	att Ile	aaa Lys	cat His	tat Tyr	917
gaa Glu 140	acg Thr	gta Val	cac His	ggt Gly	tca Ser 145	aaa Lys	gaa Glu	gtc Val	gaa Glu	gca Ala 150	ttt Phe	ctc Leu	gat Asp	gcg Ala	gtg Val 155	965
ctg Leu	gcg Ala	att Ile	gaa Glu	gaa Glu 160	cac His	att Ile	gac Asp	cct Pro	tcg Ser 165	ctc Leu	gtg Val	agg Arg	ccg Pro	aag Lys 170	ctg Leu	1013
tcg Ser	tgg Trp	agc Ser	gta Val 175	gat Asp	gat Asp	gaa Glu	gag Glu	gaa Glu 180	gaa Glu	gaa Glu	acc Thr	ggc Gly	gcg Ala 185	ccg Pro	gcc Ala	1061
act Thr	cct Pro	tat Tyr 190	gac Asp	gac Asp	ctc Leu	tgg Trp	gaa Glu 195	ctg Leu	gat Asp	cat His	aaa Lys	gga Gly 200	tcg Ser	aaa Lys	gag Glu	1109
aag Lys	aag Lys 205	aaa Lys	agg Arg	acg Thr	aaa Lys	aaa Lys 210	aag Lys	ttt Phe	ccg Pro	ccg Pro	aaa Lys 215	ccg Pro	gaa Glu	aaa Lys	gac Asp	1157
att Ile 220	ctg Leu	ctg Leu	ttc Phe	ata Ile	gaa Glu 225	gag Glu	cat His	tcg Ser	cgg Arg	gag Glu 230	ctg Leu	gag Glu	cct Pro	tgg Trp	cag Gln 235	1205
cgc Arg	gat Asp	att Ile	tta Leu	acg Thr 240	atg Met	atg Met	aga Arg	gag Glu	gaa Glu 245	atg Met	ctg Leu	tat Tyr	ttc Phe	tgg Trp 250	ccg Pro	1253
cag Gln	ctt Leu	gaa Glu	acg Thr 255	aaa Lys	atc Ile	atg Met	aat Asn	gaa Glu 260	ggc Gly	tgg Trp	gcg Ala	tcc Ser	tat Tyr 265	tgg Trp	cat His	1301
cag Gln	cga Arg	atc Ile 270	atc Ile	cgt Arg	gag Glu	ctt Leu	gat Asp 275	ctg Leu	aca Thr	tca Ser	agt Ser	gaa Glu 280	gcg Ala	atc Ile	gaa Glu	1349
ttc Phe	gcc Ala 285	aag Lys	ctg Leu	aac Asn	gcg Ala	gga Gly 290	gtg Val	gtt Val	cag Gln	ccg Pro	tcc Ser 295	aaa Lys	acg Thr	gga Gly	atc Ile	1397
aat Asn 300	cct Pro	tat Tyr	tat Tyr	ctc Leu	gga Gly 305	ttg Leu	aaa Lys	ata Ile	ttt Phe	gag Glu 310	gac Asp	ata Ile	gag Glu	gag Glu	cgc Arg 315	1445
tac Tyr	aac Asn	aac Asn	ccg Pro	aca Thr 320	gaa Glu	gac Asp	atg Met	aaa Lys	aag Lys 325	atg Met	Gly	gta Val	gag Glu	ccg Pro 330	aac Asn	1493
tct Ser	ggg Gly	aga Arg	gaa Glu 335	aaa Lys	ata Ile	ttt Phe	gaa Glu	gtc Val 340	agg Arg	gag Glu	atc Ile	gaa Glu	tca Ser 345	gac Asp	att Ile	1541

tca ttt atc agg aac tat tta acg aag gat ctt gtg atg cgg gaa gac Ser Phe Ile Arg Asn Tyr Leu Thr Lys Asp Leu Val Met Arg Glu Asp 350 355 360	1589
ctc tac ttg ttt caa aaa cag gga agg gat tat aaa atc gtc gac aag Leu Tyr Leu Phe Gln Lys Gln Gly Arg Asp Tyr Lys Ile Val Asp Lys 365 370 375	1637
gat tgg gag gct gtg cgc gat cag ctt gtc agc atg aga gtc aac gga Asp Trp Glu Ala Val Arg Asp Gln Leu Val Ser Met Arg Val Asn Gly 380 385 390 395	1685
gga ttt cct tat ttg aca gtt gag gac gga gat tac tta aag aac aat Gly Phe Pro Tyr Leu Thr Val Glu Asp Gly Asp Tyr Leu Lys Asn Asn 400 405 410	1733
gaa tta tac atc aag cat tgg tat gaa ggg atc gaa ctc gat ttg aag Glu Leu Tyr Ile Lys His Trp Tyr Glu Gly Ile Glu Leu Asp Leu Lys 415 420 425	1781
tat ctt gaa aaa gtt ctg cct tac ctc cac cag cta tgg gga aga agc Tyr Leu Glu Lys Val Leu Pro Tyr Leu His Gln Leu Trp Gly Arg Ser 430 435 440	1829
gtg cat gtc gag acc gtg ctc gaa gat aaa ccc gtc atg ttt tcc tat Val His Val Glu Thr Val Leu Glu Asp Lys Pro Val Met Phe Ser Tyr 445 450 455	1877
gat gga aag gct gtc cac cgc aga tat tta taaaggctgc attttggcag Asp Gly Lys Ala Val His Arg Arg Tyr Leu 460 465	1927
ccttttttct tttaaagcgc aacgatttca actcgtccgt cctttcaaaa gaaatgccaa	1987
attaatgcac gtttgcccag ttttacgact tcattataaa aatgtaaaat aaagtattta	2047
atgatatttc taaaattgta attttagctg ccggaaagcg taaaaatgta gtatttaagt	2107
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attaaggaat ttgacatagt aagtcaagac tatacctgat ggaattccct ccttataata	2227
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ttgaaaatat aaaatattct gctattggga ggacaacatg aaaaaacaag taataacagc	2347
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<210> 137

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<211> 469

<212> PRT

<213> Bacillus licheniformis

<400> 137

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Glu Ile Cys Pro Ala Glu Ile Ile Tyr Thr Phe Gly Ala Tyr Gly Met 35 40 45

Pro Thr Arg Tyr Ser His Trp Ser Phe Gly Lys Gln Phe His Lys Met 50 55 60

Lys Leu His Tyr Asp Phe Gly Leu Ser Lys Ile Tyr Glu Leu Val Ile 65 70 75 80

Asn Ser Asp Pro Cys Tyr Ala Phe Leu Leu Asp Ser Asn Ser Leu Ile 85 90 95

Gln Asn Lys Leu Ile Val Ala His Val Leu Ala His Cys Asp Phe Phe 100 105 110

Lys Asn Asn Cys Arg Phe Gln Asn Thr Lys Arg Asp Met Val Glu Ser 115 120 125

Met Ser Ala Thr Ala Glu Arg Ile Lys His Tyr Glu Thr Val His Gly 130 135 140

His Ile Asp Pro Ser Leu Val Arg Pro Lys Leu Ser Trp Ser Val Asp 165 170 175

Asp Glu Glu Glu Glu Thr Gly Ala Pro Ala Thr Pro Tyr Asp Asp 180 185 190

Leu Trp Glu Leu Asp His Lys Gly Ser Lys Glu Lys Lys Lys Arg Thr
195 200 205

Lys Lys Lys Phe Pro Pro Lys Pro Glu Lys Asp Ile Leu Leu Phe Ile 210 215 220

Glu Glu His Ser Arg Glu Leu Glu Pro Trp Gln Arg Asp Ile Leu Thr 225 230 235 240

Met	Met	Arg	Glu	Glu 245	Met	Leu	Tyr	Phe	Trp 250	Pro	Gln	Leu	Glu	Thr 255	Lys
Ile	Met	Asn	Glu 260	Gly	Trp	Ala	Ser	Tyr 265	Trp	His	Gln	Arg	Ile 270	Ile	Arg
Glu	Leu	Asp 275	Leu	Thr	Ser	Ser	Glu 280	Ala	Ile	Glu	Phe	Ala 285	Lys	Leu	Asn
Ala	Gly 290	Val	Val	Gln	Pro	Ser 295	Lys	Thr	Gly	Ile	Asn 300	Pro	Tyr	Tyr	Leu
Gly 305	Leu	Lys	Ile	Phe	Glu 310	Asp	Ile	Glu	Glu	Arg 315	Tyr	Asn	Asn	Pro	Thr 320
Glu	Asp	Met	Lys	Lys 325	Met	Gly	Val	Glu	Pro 330	Asn	Ser	Gly	Arg	Glu 335	Lys
Ile	Phe	Glu	Val 340	Arg	Glu	Ile	Glu	Ser 345	Asp _.	Ile	Ser	Phe	Ile 350	Arg	Asn
Tyr	Leu	Thr 355	Lys	Asp	Leu	Val	Met 360	Arg	Glu	Asp	Leu	Tyr 365	Leu	Phe	Gln
Lys	Gln 370	Gly	Arg	Asp	Tyr	Lys 375	Ile	Val	Asp	Lys	Asp 380	Trp	Glu	Ala	Val
Arg 385	Asp	Gln	Leu	Val	Ser 390	Met	Arg	Val	Asn	Gly 395	Gly	Phe	Pro	Tyr	Leu 400
Thr	Val	Glu	Asp	Gly 405	Asp	Tyr	Leu	Lys	Asn 410	Asn	Glu	Leu	Tyr	Ile 415	Lys
His	Trp	Tyr	Glu 420	Gly	Ile	Glu	Leu	Asp 425	Leu _.	Lys	Tyr	Leu	Glu 430	Lys	Val
Leu	Pro	Tyr 435	Leu	His	Gln	Leu	Trp 440	Gly	Arg	Ser	Val	His 445	Val	Glu	Thr
Val	Leu 450	Glu	Asp	Lys	Pro	Val 455	Met	Phe	Ser	Tyr	Asp 460	Gly	Lys	Ala	Val

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His Arg Arg Tyr Leu

Glu Glu Ile Gly Ala Ser 95

tttgttttga aaaaaaatga	tcttatcata	ataaaatgac	aatatatggt	ttgtgtctgc	881
gtataacagt agcaggaagg	taaagcatgc	gaactcggat	aacaaagcgc	atgcagaagg	941
aatcaatccg tctccctgat	cagttaatcc	taaatatgct	ctaaacatcc	aaaatatgct	1001
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gttagcagct ggtcaaggaa	caagaatgaa	atcaaagcta	tataaagttc	ttcatcctgt	1181
ttgcggaaaa cctatggtcg	agcatgttgt	cgatgaagct	cgcaagctat	cattagaaaa	1241
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<210> 139

<211> 97

<212> PRT

<213> Bacillus licheniformis

<400> 139

Val Glu Val Thr Asp Val Arg Leu Arg Arg Val Asn Thr Asp Gly Arg

1 10 15

Met Arg Ala Ile Ala Ser Ile Thr Leu Asp His Glu Phe Val Val His 20 25 30

Asp Ile Arg Val Ile Asp Gly Asn Asn Gly Leu Phe Val Ala Met Pro 35 40 45

Ser Lys Arg Thr Pro Asp Gly Glu Phe Arg Asp Ile Ala His Pro Ile 50 55 60

Asn Ser Ser Thr Arg Gly Lys Ile Gln Asp Ala Val Leu Asn Glu Tyr 65 70 75 80

His Arg Leu Gly Asp Val Glu Glu Ile Glu Tyr Glu Glu Ile Gly Ala 85 90 95

Ser

<210> 140 <211> 1694

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120

869

Tyr Tyr Gln Ile Asp Asp His Phe Arg Ser Leu Asn Tyr Ser Glu Lys

gcg ctc tca ctt ttc agc aag cat aaa gaa tac ata gac aaa acg atc

Ala Leu Ser Leu Phe Ser Lys His Lys Glu Tyr Ile Asp Lys Thr Ile

115

95

	_	_	_			gga Gly 130	_		_		_			_		917
						tac Tyr										965
						atc Ile										1013
		_		_		atg Met	_		_						_	1061
						gtc Val										1109
						cac His 210										1157
						aaa Lys										1205
						gcg Ala										1253
						gat Asp										1301
_					_	cat His	_	_	-	_						1349
						ggc Gly 290										1397
						aaa Lys										1445
att Ile		tgaa	aaaa	aaa (cattt	gttt	t tt	cgc	egtca	tgo	ettgt	ttg	cctg	gatgo	199	1501
ggaa	agctt	ca	cagct	gatt	c to	gcago	cacag	g gad	ggat	cgt	ttca	agcca	att g	gggaa	agtcg	1561
gtgt	ttc	tg d	ccago	ggad	g at	agag	gataa	a ctt	gccg	gaga	taga	aatg	ggc (ctcc	gtctt	1621
ttg	ctato	cat o	gtct	caco	ct ga	aaggo	caatt	gaa	aggga	agca	gtag	gtgat	gc o	gata	aaaga	1681

gatttcgcgc tgc 1694

<210> 141

<211> 317

<212> PRT

<213> Bacillus licheniformis

<400> 141

Leu Phe Ser Ala Val Gly Leu Ser Leu Gln Ile Asp Asp Gly Ala Val

1 10 15

Ser Glu Ser Ala Glu Leu Phe Arg Lys Ile Lys Arg Gln Lys Glu Thr 20 25 30

Val Lys Ser Ala Asp Asp Ile Ile Gln Tyr Tyr Phe Phe Phe Ser 35 40 45

Gly Met Tyr Glu Phe Tyr Glu Lys Asn Tyr Phe Glu Ala Ile Ser Cys 50 55 60

Tyr Lys Lys Ala Glu Ala Lys Leu His Lys Leu Thr Asp Glu Ile Glu 65 70 75 80

Lys Ala Glu Phe Tyr Tyr Lys Ile Ala Thr Ala Tyr Tyr Gln Ile Asp \$85\$ 90 95

Asp His Phe Arg Ser Leu Asn Tyr Ser Glu Lys Ala Leu Ser Leu Phe 100 105 110

Ser Lys His Lys Glu Tyr Ile Asp Lys Thr Ile Gly Cys Glu Met Ile 115 120 125

Leu Gly Ser Val Gln Phe Glu Leu Phe Arg Ile Lys Gln Ala Glu Glu 130 135 140

His Tyr Gly Arg Ala Leu Asp Gln Ala Val Ala Leu Gln Asn Arg Arg 145 150 155 160

Ile Ile Gly Leu Ile Tyr His Asn Met Gly Leu Asn Tyr Ala Lys Cys 165 170 175

Gly Met Pro Leu Leu Ala Glu Glu His Phe Arg Lys Ala Leu Ser Ile 180 185 190 Gly Val His Glu Gln Ser Val Phe Gly Ile Asn Thr Leu Phe Glu Leu 195 Ser His Leu Met Tyr Lys Asn Gly Ser Pro Glu Glu Ala Arg Arg Leu Cys Lys Glu Gly Phe Thr Arg Ser Ala Glu Leu Gly Glu Asp Glu Tyr 230 Ala Ala Lys Phe Arg Leu Ile Phe Ala Leu Tyr Asp Ala Gly His Pro 245 250 Leu Asp Ile Glu Phe Ser Leu Glu Tyr Met Ser Asp Lys Arg Leu Trp 260 265 Pro His Val Ala Glu Leu Thr Lys Asp Ile Ala Asp Tyr Tyr Met Lys 275 280 285 Ser Gly Asp His Glu Lys Ser Ala Leu Tyr Leu Glu Lys Ser Gln His 290 295 300 Ala Lys Asn Gln Ile Tyr Lys Met Lys Glu Gly Ile Ile 310 <210> 142 <211> 1260 <212> DNA <213> Bacillus licheniformis <220> <221> CDS (501)..(1244) <222> <400> 142 attggcagac acacaggact taaaatcctg cggtaggtga ctaccgtgcc ggttcaagtc 60 eggeeetegg caccattgat cacacacatg eeggtgtgge ggaattggea gaegegeaeg 120 actcaaaatc gtgttccttc gggagtgtcg gttcgacccc gaccaccggt atcactaaac 180 atcgtattgc caaacgatga aagagcgttc ctacaaaagg agcgctcttt ttatttattc 240 cttatcttgg aacgaagccg taagaatttt ttcttaagga ctgcgagctc cggaagctac 300 gggaacatac cgtgagattt atcgaaatga gcttaatacg gtgcagaaac ttttacaaaa 360

gcaaaaatat atctgatgat ttattatcta tttatagggc gaaaagtaaa ttattgatac	420
aaacttcttt gcaaagattg gtaactttct gtaaaatgtt ctcatagcga tagaggcagt	480
aaagtgtggg aggtttgaca atg aaa gca gca gcc tct gtg aac gta gcc aat Met Lys Ala Ala Ala Ser Val Asn Val Ala Asn 1 5 10	533
ctc atc aat cag tgg tat gtt cac ata aaa aag aga gat gtt tca aat Leu Ile Asn Gln Trp Tyr Val His Ile Lys Lys Arg Asp Val Ser Asn 15 20 25	581
gcc gta gaa ctt agg gac aga ata aaa ggc ctt tta aac gta atg gaa Ala Val Glu Leu Arg Asp Arg Ile Lys Gly Leu Leu Asn Val Met Glu 30 35 40	629
gaa gat cag gat gtt ttg ctt tac ttt aat cta ctt gat tac agg ttc Glu Asp Gln Asp Val Leu Leu Tyr Phe Asn Leu Leu Asp Tyr Arg Phe 45 50 55	677
aga gta tta atg gaa gac gtc gcg ggg gag ccg cag ctt ccg cct att Arg Val Leu Met Glu Asp Val Ala Gly Glu Pro Gln Leu Pro Pro Ile 60 65 70 75	725
gct gaa gat aag gcg aag aca gac ggt ttg tta cga tac tat tac ttt Ala Glu Asp Lys Ala Lys Thr Asp Gly Leu Leu Arg Tyr Tyr Tyr Phe 80 85 90	773
ctc ttt aaa gga atg tat gaa agt gcg agg agc aac tac tct aaa gcg Leu Phe Lys Gly Met Tyr Glu Ser Ala Arg Ser Asn Tyr Ser Lys Ala 95 100 105	821
ctt aat tgt ttt aga gtt gcc gag cgg cag ctc gat aat gtc gaa gat Leu Asn Cys Phe Arg Val Ala Glu Arg Gln Leu Asp Asn Val Glu Asp 110 115 120	869
gaa atc gaa aag gcc gag ttt cat tat aag ctt gga aat ctc tat tat Glu Ile Glu Lys Ala Glu Phe His Tyr Lys Leu Gly Asn Leu Tyr Tyr 125 130 135	917
ttt acg aaa aca act cta ctt tct ttt cat cat ctt tca atc gcg aag Phe Thr Lys Thr Thr Leu Leu Ser Phe His His Leu Ser Ile Ala Lys 140 145 150 155	965
agc att tat agg gct tat gaa gaa tat aag aca cag tcg ata aac tgt Ser Ile Tyr Arg Ala Tyr Glu Glu Tyr Lys Thr Gln Ser Ile Asn Cys 160 165 170	1013
acg gtg ctg ctc gca ctc aat tat ata gac gac gga cgt tta aca aga Thr Val Leu Leu Ala Leu Asn Tyr Ile Asp Asp Gly Arg Leu Thr Arg 175 180 185	1061
gct gaa aat atg ctt aag agt tgc gca gaa aga ctg atc aag atg ggc Ala Glu Asn Met Leu Lys Ser Cys Ala Glu Arg Leu Ile Lys Met Gly 190 195 200	1109
gat aat cat ctg ctg gcg gct gtc tac tat gat ctc ggc ttt tta aaa	1157

Asp Asn His Leu Le 205	ı Ala Ala Val 210	Tyr Tyr Asp Leu Gly 215	Phe Leu Lys	
		gca ctc gag tat ttc Ala Leu Glu Tyr Phe 230		.205
	o Ile Glu Lys	aat gag ccg ggg act Asn Glu Pro Gly Thr 245		.254
gatgta			1	.260
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Tyr Val His Ile Ly 20	s Lys Arg Asp	Val Ser Asn Ala Val 25	Glu Leu Arg 30	
Asp Arg Ile Lys Gl 35	y Leu Leu Asn 40	Val Met Glu Glu Asp 45	Gln Asp Val	
Leu Leu Tyr Phe As 50	n Leu Leu Asp 55	Tyr Arg Phe Arg Val	Leu Met Glu	
Asp Val Ala Gly Gl	u Pro Gln Leu 70	Pro Pro Ile Ala Glu 75	Asp Lys Ala 80	
Lys Thr Asp Gly Le	u Leu Arg Tyr	Tyr Tyr Phe Leu Phe	Lys Gly Met 95	
Tyr Glu Ser Ala Ar	g Ser Asn Tyr	Ser Lys Ala Leu Asr 105	Cys Phe Arg	
Val Ala Glu Arg Gl 115	n Leu Asp Asn 120	Val Glu Asp Glu Ile 125		
Glu Phe His Tyr Ly 130	s Leu Gly Asn 135	Leu Tyr Tyr Phe Thi	Lys Thr Thr	

Leu Leu Ser Phe His His Leu Ser Ile Ala Lys Ser Ile Tyr Arg Ala 160 150 155 145 Tyr Glu Glu Tyr Lys Thr Gln Ser Ile Asn Cys Thr Val Leu Leu Ala Leu Asn Tyr Ile Asp Asp Gly Arg Leu Thr Arg Ala Glu Asn Met Leu Lys Ser Cys Ala Glu Arg Leu Ile Lys Met Gly Asp Asn His Leu Leu 195 200 Ala Ala Val Tyr Tyr Asp Leu Gly Phe Leu Lys Ile Gln Glu Asp Lys 215 210 His Glu Glu Ala Leu Glu Tyr Phe Asp Leu Ser Phe Lys Thr Gly Asp 235 230 225 Ile Glu Lys Asn Glu Pro Gly Thr 245 <210> 144 <211> 2119 DNA <212> <213> Bacillus licheniformis <220> <221> CDS (501)..(1619) <222> <400> 144 tacgcagtcg aaatgaaccg tcttatcaag ttcgagatgg aagggtctat tggttaaccc 60 ttgatactaa agggggtgat cagacttcga tttgattgca cccgaataaa ctttatgttt 120 gtgtaccgca gatataatct attgcctatc gattttctaa aaggcgtaga aatgtatctg 180 cggttttttc tttagctttt tatttcataa aagaggtttg aattttgctt cctaacgatt 240 agttatgcca aattacatat caacaggaaa atataatcct tcatctgttc tgccttcctt 3.00 cctatacttc taaaattcac ccaaacacgg aaaacgaatc atattgatta ggccaaaaaa 360 420 cctctaactt ataaagattt ctgagaatgt tgttgtgaaa aattattact tttatgtaaa atgatgacta tgaataaaaa gggaattgct attttgggtt tttagaaaaa ttataatctt 480 533 gcgagaaagg aagaggatat gtg agc gtg ata cca tat gat ttg gtt gcg acg

Val Ser Val Ile Pro Tyr Asp Leu Val Ala Thr

1 5 10

	atg Met						-								_	581
_	gag Glu	_		_		_	_	_	_	_		_		_	_	629
	aat Asn 45		-	-		_										677
	ctt Leu			-		_						_				725
_	cgt Arg		_				_		_	_	_			_	_	773
	atg Met	_	_							_		_				821
-	caa Gln		-					-					_	-	-	869
	aaa Lys 125															917
	ttc Phe	_	_		-					_						965
	atg Met															1013
	tac Tyr			_	_	_		_	_				_			1061
	cta Leu															1109
	ctt Leu 205															1157
	cat His															1205

aaa gca acc tac aat ttt caa aga gct ctg aac ctt tat aaa gag gag Lys Ala Thr Tyr Asn Phe Gln Arg Ala Leu Asn Leu Tyr Lys Glu Glu 240 245 250	1253
aag cat agt ttt ttg cca aaa aca tta ttc aac ctc gca cat gtc agg Lys His Ser Phe Leu Pro Lys Thr Leu Phe Asn Leu Ala His Val Arg 255 260 265	1301
gca aag caa ggg aag ttg tca ata act gat gac cta tac tat gaa ggc Ala Lys Gln Gly Lys Leu Ser Ile Thr Asp Asp Leu Tyr Tyr Glu Gly 270 275 280	1349
aaa gag ttg gct gaa aag aac aag aat tta gat atg ctt gca aag ttt Lys Glu Leu Ala Glu Lys Asn Lys Asn Leu Asp Met Leu Ala Lys Phe 285 290 295	1397
gat tta ata aaa ggg ctt tat ctt tca ttt gat ctg gat atg gtt cgc Asp Leu Ile Lys Gly Leu Tyr Leu Ser Phe Asp Leu Asp Met Val Arg 300 305 310 315	1445
gaa tcg ttc aag ttt ttc gaa agt aaa ggc aag tat gca gac atg gag Glu Ser Phe Lys Phe Phe Glu Ser Lys Gly Lys Tyr Ala Asp Met Glu 320 325 330	1493
gaa tac ggt ctt ata gcg gct gaa cta tta gag aaa aaa gaa aaa att Glu Tyr Gly Leu Ile Ala Ala Glu Leu Leu Glu Lys Lys Glu Lys Ile 335 340 345	1541
cga gat gca gtg gaa ttc tac cgg ata aca gtt aat gcg aga aga caa Arg Asp Ala Val Glu Phe Tyr Arg Ile Thr Val Asn Ala Arg Arg Gln 350 355 360	1589
att caa agg agt gct ttt cta cat gta aac taaatcgttc taggggtagt Ile Gln Arg Ser Ala Phe Leu His Val Asn 365 370	1639
taaagcagca ggatttctta ctataaaaaa gaatttcccc cagcattatt aaaacctcaa	1699
attttgatta cttgattatt attttaagta atcgcagaaa gaaaggtcgg tctatggcaa	1759
gctatttaaa atccagaatc gtatcttatc tgtttattct tttggaagtg gggaccggat	1819
togoaatttg ogaggtgtoa atggaaaato ogaattacto otoagottgo goggtottta	1879
tcataggttt tacgattggg gaatgcttca tgattagaaa atggtaaatt ttgatcatga	1939
cgggatactc tttaccctct tctataaaag tgggacagac agttgaaaag ccggtaaatt	1999
catageettg tattteaaca gtaaettett etatatgegg gttteatttt tteatetttg	2059
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<210> 145

<211> 373 <212> PRT

<213> Bacillus licheniformis

<400> 145

Val Ser Val Ile Pro Tyr Asp Leu Val Ala Thr Lys Met Asn Phe Trp

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Tyr Thr Ala Leu Lys Asn Asn Trp Thr Gly Lys Ala Glu Asp Thr Lys
20 25 30

Lys Glu Val Glu Arg Glu Leu Glu Gln Met Glu Gln Asn Gln Asp Val 35 40 45

Ile Val Tyr Tyr Asn Leu Leu Leu Phe Arg His Asn Leu Gln Leu Asp 50 55 60

Tyr Met Tyr Ser Lys Pro Gly Val Asn Leu Asn Ser Arg Phe Asp Glu 65 70 75 80

Phe Lys Lys Ile Arg Asp Gln Asn Asn Leu Glu Gly Met Leu Asp Tyr 85 90 95

Tyr Tyr His Phe Phe Ala Gly Met Tyr His Phe Arg Gln Lys Glu Leu 100 105 110

Ile Leu Ala Leu Asn Phe Tyr Arg Asp Ala Glu Lys Lys Leu Asp Ser 115 120 125

Phe Asp Cys Asp Glu Leu Glu Lys Ala Glu Phe Tyr Phe Lys Ala Ser 130 135 140

Glu Val Tyr Tyr His Met Lys Gln Thr Ile Phe Ser Met Asn Tyr Ala 145 $\,$ 150 $\,$ 155 $\,$ 160

Ser Arg Ala Tyr Asn Leu Phe Lys Lys Tyr Asp Thr Tyr Gly Glu Arg 165 170 175

Arg Val Gln Ser Gln Phe Ile Ile Ala Gly Asn Trp Leu Asp His Met 180 185 190

Tyr Pro Glu Lys Ala Leu His Asn Leu Asn Lys Glu Leu Lys Glu Ser 195 200 205

Glu Thr Gln Gly Ile Leu His Leu Met Gly Ser Ser His Leu Asn Ile

210 215 220

245

Gly Ile Cys Tyr Asn Lys Leu Glu Asp Val Asp Lys Ala Thr Tyr Asn 225 230 230 240

Phe Gln Arg Ala Leu Asn Leu Tyr Lys Glu Glu Lys His Ser Phe Leu

250

Pro Lys Thr Leu Phe Asn Leu Ala His Val Arg Ala Lys Gln Gly Lys 260 265 270

Leu Ser Ile Thr Asp Asp Leu Tyr Tyr Glu Gly Lys Glu Leu Ala Glu 275 280 285

Lys Asn Lys Asn Leu Asp Met Leu Ala Lys Phe Asp Leu Ile Lys Gly 290 295 300

Leu Tyr Leu Ser Phe Asp Leu Asp Met Val Arg Glu Ser Phe Lys Phe 305 310 315 320

Phe Glu Ser Lys Gly Lys Tyr Ala Asp Met Glu Glu Tyr Gly Leu Ile 325 330 335

Ala Ala Glu Leu Leu Glu Lys Lys Glu Lys Ile Arg Asp Ala Val Glu 340 345 350

Phe Tyr Arg Ile Thr Val Asn Ala Arg Arg Gln Ile Gln Arg Ser Ala 355 360 365

Phe Leu His Val Asn 370

<210> 146

<211> 1405

<212> DNA

<213> Bacillus licheniformis

<220>

<221> CDS

<222> (501)..(905)

<400> 146

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ctttatttta aaagggtttc gaggagctgt ggaagctgtt gcaggcatca ataaaagatc	180
aatattttct ttaagttgat cattcacaaa tcgaattact tctttattag gccaagtttc	240
attttcatgg atgcacaggg tttatccgca aattccttca aatagtaaac ccttcaagat	300
cgcggtggac gaaatttccc ttcgagaata ctgcaggtgc ggcttgaaaa agagcatata	360
gagattcagg cgtcttagca ggcgtctttt tgttgctgat tttattgcgg cataccgaaa	420
attttttcac ttttcaacct attatcaccc gaattatagt aatatattta caaaaatgaa	480
ataaaaaggt ataggcggaa gtg aaa cag tta ata ccc tcg tca aaa gtc gga Val Lys Gln Leu Ile Pro Ser Ser Lys Val Gly 1 5 10	533
gtg aaa atc cac gaa tgg tat aaa atg ata aga gag ttt agc gta ccg Val Lys Ile His Glu Trp Tyr Lys Met Ile Arg Glu Phe Ser Val Pro 15 20 25	581
gat gca gag gct tta aaa gaa gaa gta gag aag gaa att aat caa atg Asp Ala Glu Ala Leu Lys Glu Glu Val Glu Lys Glu Ile Asn Gln Met 30 35 40	629
gaa gaa gat cag gac tta ctc ctt tac tat cag ttg atg tgt ttt aga Glu Glu Asp Gln Asp Leu Leu Tyr Tyr Gln Leu Met Cys Phe Arg 45 50 55	677
cat caa tta atg tta gaa tat tta gaa cct act aac aaa aga aaa caa His Gln Leu Met Leu Glu Tyr Leu Glu Pro Thr Asn Lys Arg Lys Gln 60 65 70 75	725
gga caa tca ata aac aaa ttg ttg gcc caa atc gag gag cct cga aga Gly Gln Ser Ile Asn Lys Leu Leu Ala Gln Ile Glu Glu Pro Arg Arg 80 85 90	773
gat tta aat ggc ctc ctt agt tac tac tca ttt ttc ttt agg ggc atg Asp Leu Asn Gly Leu Leu Ser Tyr Tyr Ser Phe Phe Phe Arg Gly Met 95 100 105	821
tat gaa ttt gag aaa aaa cag tac atc aaa gca ata gag ttt tat cga Tyr Glu Phe Glu Lys Lys Gln Tyr Ile Lys Ala Ile Glu Phe Tyr Arg 110 115 120	869
aac gca gaa aaa cag ttg gct ctc att acg atg tta tagaacaagc Asn Ala Glu Lys Gln Leu Ala Leu Ile Thr Met Leu 125 130 135	915
cgagtttcac tttaaaatgg ctgaagcata ctacatcatg aaacagacac atgtatcata	975
tattaagggc ctttaaaata tacaataatc atgaactcta cacagtccgt aaaatccaat	1035
gtttatttgt tatcgcgggt aactatgacg atttaatgcg ccatgacaaa gccttacccc	1095
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atgctgaaaa	agccgtagag	attaatctaa	aagaagaata	taacaaccta	ccacaatcat	1275
tatattactc	tactcaactt	ctttttaagc	agaaaaacta	cgagcgcgca	atcgagatat	1335
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<210> 147

<211> 135

<212> PRT

<213> Bacillus licheniformis

<400> 147

Val Lys Gln Leu Ile Pro Ser Ser Lys Val Gly Val Lys Ile His Glu
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Trp Tyr Lys Met Ile Arg Glu Phe Ser Val Pro Asp Ala Glu Ala Leu 20 25 30

Lys Glu Glu Val Glu Lys Glu Ile Asn Gln Met Glu Glu Asp Gln Asp 35 40 45

Leu Leu Leu Tyr Tyr Gln Leu Met Cys Phe Arg His Gln Leu Met Leu 50 60

Glu Tyr Leu Glu Pro Thr Asn Lys Arg Lys Gln Gly Gln Ser Ile Asn 65 70 75 80

Lys Leu Leu Ala Gln Ile Glu Glu Pro Arg Arg Asp Leu Asn Gly Leu 85 90 95

Leu Ser Tyr Tyr Ser Phe Phe Phe Arg Gly Met Tyr Glu Phe Glu Lys
100 105 110

Lys Gln Tyr Ile Lys Ala Ile Glu Phe Tyr Arg Asn Ala Glu Lys Gln
115 120 125

Leu Ala Leu Ile Thr Met Leu 130 135

<210> 148

<211> 2104

<212> DNA

<213> Bacillus licheniformis

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gtaatcgatg gtatggtcat ttttaatgta gatttcatat tcccatccgt tttcatacgt	180
atagatcata tggcttccta caaactcttt tacatcttga ttcatatgaa ccgctccttt	240
atttgtttat tgtaatcgaa acatgttgat atttacatat ataattataa aatgccgtca	300
aaaaagatgt caaacgaaaa tacttcctga gagatttgca caaataaaga agattgttac	360
gattaatgtc agaattttga gttatcttag gaaattatgc caatatttag aaaagtgatt	420
gtcaaaaaat aagcgattct gtaaaatgaa aaacaaccca taaaaaggaa atgacatggg	480
aagaaaggaa ggataaacga ttg aag aca aaa att gcg tat gag gaa gtt gcg Leu Lys Thr Lys Ile Ala Tyr Glu Glu Val Ala 1 5 10	533
gga atg ctt aat caa tgg tat gtc atg atc aag cgt cac gaa gta tca Gly Met Leu Asn Gln Trp Tyr Val Met Ile Lys Arg His Glu Val Ser 15 20 25	581
caa gcg gtc tcg att aaa tgc gac att gag cac cag ctg ccg aat atg Gln Ala Val Ser Ile Lys Cys Asp Ile Glu His Gln Leu Pro Asn Met 30 35 40	629
gaa gaa aat caa gat ctg ctt ctt tat ttt aat ctt tta gac tat cgg Glu Glu Asn Gln Asp Leu Leu Tyr Phe Asn Leu Leu Asp Tyr Arg 45 50 55	677
cac aag ctg ctg aca gaa gag ttt gcc gct tcc aac aaa ctg ttc gag His Lys Leu Leu Thr Glu Glu Phe Ala Ala Ser Asn Lys Leu Phe Glu 60 65 70 75	725
gat att cag gag caa aaa gcc gat atg caa agc aca gat gac atg att Asp Ile Gln Glu Gln Lys Ala Asp Met Gln Ser Thr Asp Asp Met Ile 80 85 90	773
gaa tat tat tat ttc ttt ttc gct ggc atg tac gaa ttt cat aag aag Glu Tyr Tyr Tyr Phe Phe Phe Ala Gly Met Tyr Glu Phe His Lys Lys 95 100 105	821
gat tat aca aat gca atc aat tat tat aaa tta gcc gag gaa aag ctc Asp Tyr Thr Asn Ala Ile Asn Tyr Tyr Lys Leu Ala Glu Glu Lys Leu 110 115 120	869
agg aca atc ccc gat caa atc gaa atc gcc gaa ttc cat tac aaa ctg	917

Arg	Thr 125	Ile	Pro	Asp	Gln	Ile 130	Glu	Ile	Ala	Glu	Phe 135	His	Tyr	Lys	Leu	
					caa Gln 145											965
					aaa Lys											1013
					gat Asp											1061
ttt Phe	cgt Arg	ttt Phe 190	gat Asp	gaa Glu	gcc Ala	gaa Glu	cag Gln 195	cat His	tac Tyr	aag Lys	caa Gln	gcc Ala 200	ctt Leu	aaa Lys	gac Asp	1109
gcg Ala	gca Ala 205	ctg Leu	atc Ile	aaa Lys	cat His	cat His 210	gtc Val	ctc Leu	ctc Leu	ggc Gly	atg Met 215	gct Ala	cac His	cac His	aac Asn	1157
					gtc Val 225											1205
cat His	ttc Phe	aaa Lys	gaa Glu	gcg Ala 240	ctg Leu	ctt Leu	atc Ile	aaa Lys	gag Glu 245	cat His	gaa Glu	gaa Glu	tcg Ser	gtt Val 250	tac Tyr	1253
					ttt Phe											1301
gtt Val	gtc Val	aaa Lys 270	gaa Glu	gca Ala	. cgc Arg	aaa Lys	ttg Leu 275	tat Tyr	gaa Glu	aaa Lys	gga Gly	ttt Phe 280	ttc Phe	cgt Arg	gcg Ala	1349
gaa Glu	aaa Lys 285	gca Ala	gga Gly	gaa Glu	agg Arg	gaa Glu 290	tat Tyr	ttg Leu	tcg Ser	aaa Lys	ttt Phe 295	aaa Lys	ctt Leu	att Ile	cat His	1397
gct Ala 300	ctg Leu	tat Tyr	gat Asp	gaa Glu	cag Gln 305	gat Asp	cca Pro	ctt Leu	acg Thr	gtt Val 310	gaa Glu	cat His	gct Ala	tta Leu	gaa Glu 315	1445
tat Tyr	ctt Leu	aaa Lys	acg Thr	atc Ile 320	aat Asn	ctc Leu	tgg Trp	acg Thr	gat Asp 325	gta Val	gcg Ala	gaa Glu	tta Leu	aca Thr 330	ttt Phe	1493
gat Asp	atc Ile	gca Ala	ctt Leu 335	tac Tyr	tat Tyr	aaa Lys	gaa Glu	aat Asn 340	gga Gly	gat Asp	gca Ala	gac Asp	aaa Lys 345	gct Ala	gcc Ala	1541
gaa Glu	tat Tyr	ttt Phe	gaa Glu	gaa Glu	tct Ser	cat His	cat His	gca Ala	aga Arg	gac Asp	caa Gln	att Ile	ctt Leu	aaa Lys	aga Arg	1589

350)	355		360		
acg gag gag Thr Glu Glu 365		gaaaaagat ga	attgccgtt g	cgttgactg co	egtetttge	1644
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ctcaccggct	tttggtcgaa	tcctattgaa	aaatctgccc	gatttatagt	gcttgtcatt	2004
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2104

<210> 149

<211> 368

<212> PRT

<213> Bacillus licheniformis

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<400> 149

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Trp Tyr Val Met Ile Lys Arg His Glu Val Ser Gln Ala Val Ser Ile
20 25 30

Lys Cys Asp Ile Glu His Gln Leu Pro Asn Met Glu Glu Asn Gln Asp 35 40 45

Leu Leu Tyr Phe Asn Leu Leu Asp Tyr Arg His Lys Leu Leu Thr 50 55 60

Glu Glu Phe Ala Ala Ser Asn Lys Leu Phe Glu Asp Ile Gln Glu Gln 65 70 75 80

Lys Ala Asp Met Gln Ser Thr Asp Asp Met Ile Glu Tyr Tyr Tyr Phe 85 90 95

Phe Phe Ala Gly Met Tyr Glu Phe His Lys Lys Asp Tyr Thr Asn Ala 100 105 110

Ile	Asn	Tyr 115	Tyr	Lys	Leu	Ala	Glu 120	Glu	Lys	Leu	Arg	Thr 125	Ile	Pro	Asp
Gln	Ile 130	Glu	Ile	Ala	Glu	Phe 135	His	Tyr	Lys	Leu	Ala 140	Ile	Ala	Tyr	Tyr
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Ala	Glu	Gln 195	His	Tyr	Lys	Gln	Ala 200	Leu	Lys	Asp	Ala	Ala 205	Leu	Ile	Lys
His	His 210	Val	Leu	Leu	Gly	Met 215	Ala	His	His	Asn	Leu 220	Gly	Leu	Ser	Tyr
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Tyr Lys Glu Asn Gly Asp Ala Asp Lys Ala Ala Glu Tyr Phe Glu Glu 340 345 350

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Leu Glu Le 50	u Ala I	le Glu Ile 55	Asp Asn	Lys Arg	Leu Ile Ser 60	Ser Ala
Tyr Phe As	n Ile A	Ala Asp Cys	His Glu	Cys Met	Gly Asp Ile	Asp Ala

Ala Val Glu Tyr Ala Glu Lys Ala Val Glu Ile Asn Leu Lys Glu Glu Tyr Asn Asn Leu Pro Gln Ser Leu Tyr Tyr Ser Thr Gln Leu Leu Phe 100 105 Lys Gln Lys Asn Tyr Glu Arg Ala Ile Glu Ile Phe Leu Ile Gly 115 120 <210> 152 <211> 1735 <212> DNA <213> Bacillus licheniformis <220> <221> CDS <222> (501)..(1235) <400> 152 ggcttgttcc cgacggaggc ggacacttct ttttagagcg gagaatcggt gaaactgcgg 60 ccaaagaatt gatttggagc gggaaaaaat tgacgggggc cgaagcgcac gagcttcgga 120 tegeagaege egtatteage ggggaeteeg geegttttge gegeatetat ettgaaaage 180 ttctgcacgc tccgctggca gcgatgattg agacaaaaaa gatctatcag gcgttgaatg 240 gaggcaggct gcagaaaacg cttgaactcg agaaaacggc ccagatgaaa atgaggctga 300 caagcgacca tcaggaaggg atccgcgcat ttttagaaaa gcgccagccg caatttaacc 360 qtcaqcaaqt ataacaaqaq cqqtccqqca qqaaattqac cttqqqaaat qatqtqcaqa 420 aacaattgta aaaaaattta agtttccata aaatgattca taagatacag atctgtacga 480 agtettggga ggeggegaaa ttg aaa eag aag att eea tet gaa tae gtt get 533 Leu Lys Gln Lys Ile Pro Ser Glu Tyr Val Ala 10 aga aag ctg aat gat tgg tac aac gcc att cgg aaa aat cag atc gcc 581 Arg Lys Leu Asn Asp Trp Tyr Asn Ala Ile Arg Lys Asn Gln Ile Ala _20 gcc agt gaa tca ttg aaa gcg gaa att tta aat gat ttt caa gac atg 629 Ala Ser Glu Ser Leu Lys Ala Glu Ile Leu Asn Asp Phe Gln Asp Met 35 677 gaa gaa aat cgg gac gtc ctg ctc tac tat tcg ctg ctt gaa ttc agg Glu Glu Asn Arg Asp Val Leu Leu Tyr Tyr Ser Leu Leu Glu Phe Arg

725

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gaa gac gcc agg Glu Asp Ala Arg 205	aaa atc aa Lys Ile Lys 21	s Asn Ser His	ttg acg gca gc Leu Thr Ala Al 215	c gct cat 1157 a Ala His
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1615

1675

1735

170

165

Phe Cys Asp Phe Ile Ile Ala Gly Asn Trp Val Glu Ser Met Thr Tyr 180 Gly Pro Ala Leu Lys Ser Leu Ala Asn Ala Leu Glu Asp Ala Arg Lys 200 195 Ile Lys Asn Ser His Leu Thr Ala Ala Ala His Phe Asn Leu Gly Asn 220 215 210 Cys Tyr Phe His Gln Glu Ser Tyr Arg Glu Ala Ser Asp His Met Glu 240 230 235 225 Arg Pro Phe His Phe <210> 154 <211> 2116 <212> DNA <213> Bacillus licheniformis <220> <221> CDS (501) .. (1616) <222> <400> 154 60 attectegta aaaggegegg ategegtege egeettttee etttaaagea teateaagtg 120 atgtgatgcc ctcaacagcc tttttgactt tggcgatttc gtctgattgt tgttttaatt gttccagcgt ttgatctatt gcattgtgca gcgcctgaac atcaagagtc ttcatggcat 180 tctcctctaa tccttttcat tacaatcagt atatagttta ccactttata gaaagtactt 240 ggtgaatata tcctgttcaa ccatgaaaat gaatcattgg gcttaggtca ttatttctat 300 tgattcattt cgattaccgt aaacaagttt gttgtagcat tctttaggct ctgtgactaa 360 accaaaaagc cattigtitt aaattigtict ticggtatca cgaaaattic gttittiggg 420 ctgatagaag ttttgcaatt atgaattgta tgttaatctt taacataaaa aggatgttag 480 533 ctggaaggga atgatggcag ttg gag act atc ccg tct tca gaa gtt gga atc Leu Glu Thr Ile Pro Ser Ser Glu Val Gly Ile aaa ata aac cgc tgg tac aac gaa att caa aaa tta aac gta ata gaa 581 Lys Ile Asn Arg Trp Tyr Asn Glu Ile Gln Lys Leu Asn Val Ile Glu 15

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Gly Leu Cys Leu Pro Ser Gly Ser Ser Met Thr Arg Lys Glu Gln Asp

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						gaa Glu										821
						aaa Lys										869
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						gcc Ala										965
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-			-	-	-	tgt Cys									_	1061
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						ctc Leu 210										1157
		_				ttc Phe		_	_		_	_			_	1205
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						cgc Arg										1301
			_	_	_	gag Glu			_	_						1349
						aaa Lys 290		_	_						_	1397
aaa	gag	cag	gac	att	cat	tca	ggt	gtg	tat	tat	cct	tgc	tgc	ctt	cat	1445

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Pro	Lys	Lys 115	Ile	Glu	Glu	Lys	Ile 120	Thr	Pro	Ala	Thr	Lys 125	Ala	Ile	Ile
Pro	Val 130	His	Ile	Phe	Gly	Gln 135	Pro	Ala	Asp	Met	Asp 140	Glu	Ile	Met	Glu
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Phe	Gly	Ala	Ser	Tyr 165	Lys	Glu	Arg	Pro	Val 170	Gly	Ser	Ile	Gly	Asp 175	Ala
Ala	Cys	Phe	Ser 180	Phe	Phe	Pro	Thr	Lys 185	Asn	Leu	Gly	Thr	Leu 190	Gly	Asp
Gly	Gly	Met 195	Val	Thr	Ile	Ser	Asp 200	Pro	Asp	Ala	Ala	Arg 205	Gln	Leu	Arg
Thr	Leu 210	Arg	Thr	His	Gly	Thr 215	Ser	Lys	Lys	Tyr	Phe 220	His	Asp	Lys	Ile
Gly 225	Phe	Asn	Ser	Arg	Leu 230	Asp	Glu	Leu	His	Ala 235	Ala	Ala	Leu	Leu	Ile 240
Leu	Leu	Glu	Lys	Ile 245	Asp	Gly	Trp	Asn	Glu 250	Gln	Arg	Arg	Arg	Val 255	Ala
Ser	Arg	Tyr	Arg 260	Glu	Gly	Leu	Lys	Thr 265	Ala	Glu	His	Leu	Thr 270	Leu	Pro
Ala	Glu	Lys 275	Glu	Asp	Arg	Thr	His 280	Ile	Tyr	His	Leu	Tyr 285	Cys	Ile	Gly

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581

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Val	Arg	Thr 35	Phe	Ala	Asp	His	Met 40	Arg	Gln	Tyr	Val	Ser 45	Ala	Lys	His
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Asn Tyr Arg Leu Ser Asp Ile Gln Ala Ala Leu Gly Ile Lys Gln Leu 240 225 230 Gln Lys Leu Asp Asp Ile Ile His Arg Arg Asn Leu Gln Gln Lys Ala Tyr Ser Glu Gln Leu Glu Pro Leu Gly Phe Gln Ser Gln Lys Ile Gly Pro Ala Val Val His Asn Ile Gln Ser Ala Val Phe Lys Val Pro Lys 280 275 Asn Ile Val Arg Asp Glu Leu Ile Gln Tyr Leu Ser Asp Cys His Ile 295 290 Glu Ser Thr Phe Gly Thr Tyr Cys Leu Ser Gly Thr Pro Tyr Tyr Arg 315 310 305 Arg Lys Tyr Gln Gln Leu Lys Ser Asn Ser Leu Phe Leu Glu Gln His 335 325 330 Thr Ile Thr Leu Pro Cys His Asp Glu Val Asp Leu Asp His Val Val 350 340 345 Ser Ala Ile Gln Ser Phe Ile Lys Phe Lys Val Asp 355 <210> 168 <211> 1663 <212> DNA <213> Bacillus licheniformis <220> <221> CDS <222> (501)..(1163) <400> 168 tecgttgeet ttetgatett cagegeegga geettgaetg ttttgetttt gattetegeg 60 tggtttccgg ttcatcaaac acagctgctc ctcgtatttt tcatcgggct gtcggcagcc 120 180 ggcatttttc cgtgcgccgt cactcttgcc tcgttggctg gaaagccttt tacagaggaa atcacgagtc tcttcatttc gtccgcaagt ctgggaggag cgcttctttc attcttgatc 240 ggctgggcga ttgatgcaag cgcagccgct gtcttcccgt ttttgctgtt cggcggattg 300

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Asp Glu Val Asn Lys Gln Ile Thr Lys Trp Val Glu Asn Leu Thr Ser

Val Glu Glu Ala Arg Gln Val Ile Arg Ser Lys Leu Pro Glu Ile Gln

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<213> Bacillus licheniformis

<400> 171

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420

attaagcage teggeggaga aatgategte tgegeeattt eeeetgetgt caaaegttta

tttgatatgt ccgggctgtt taaaatcatt cgccttgagc aatcagagca gcgtgcactt	480
gaaacgttgg gggtggcgtc atg aaa aat gaa atg aac att cag ttt aca gcg Met Lys Asn Glu Met Asn Ile Gln Phe Thr Ala 1 5 10	533
ctc agc caa aat gaa tcg ttt gca cgg gtg aca gtc gct gct ttt atc Leu Ser Gln Asn Glu Ser Phe Ala Arg Val Thr Val Ala Ala Phe Ile 15 20 25	581
gct cag ctt gac ccg acg atg gat gaa ctg acc gaa att aaa acg gtc Ala Gln Leu Asp Pro Thr Met Asp Glu Leu Thr Glu Ile Lys Thr Val 30 35 40	629
gta tcc gaa gcg gtc aca aac gcg atc att cac ggt tat gaa aac tca Val Ser Glu Ala Val Thr Asn Ala Ile Ile His Gly Tyr Glu Asn Ser 45 50 55	677
ggg cag gga aac gta tat att tcc gtc act ctc gag gac cat att gtc Gly Gln Gly Asn Val Tyr Ile Ser Val Thr Leu Glu Asp His Ile Val 60 65 70 75	725
tat tta acg atc cgc gac gaa gga gtc ggc atc cct aat ctt gaa gaa Tyr Leu Thr Ile Arg Asp Glu Gly Val Gly Ile Pro Asn Leu Glu Glu 80 85 90	773
gcg cgc cag ccc ctg ttc acg aca aag cct gaa ctc gag cgg tcg gga Ala Arg Gln Pro Leu Phe Thr Thr Lys Pro Glu Leu Glu Arg Ser Gly 95 100 105	821
atg ggc ttt acg atc atg gaa aat ttc atg gat gat att tcg atc gac Met Gly Phe Thr Ile Met Glu Asn Phe Met Asp Asp Ile Ser Ile Asp 110 115 120	869
tcc tca cct gag atg gga acc aca ata cac tta aca aag cac tta tca Ser Ser Pro Glu Met Gly Thr Thr Ile His Leu Thr Lys His Leu Ser 125 130 135	917
aaa agc aaa gcg ctt tgc aat taagggagat ttgttatgga tgtggaggtt Lys Ser Lys Ala Leu Cys Asn 140 145	968
aaaaaagaaa accagaacac tcagcttaaa gaccatgaag tgaaagaact gattaaaaac	1028
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ggctgcatcg gcctcttgaa gtcggtggac aaattcgatc tttcctatga cgttcggttt	1208
tccacctacg ccgttccgat gattatcggc gagattcagc ggtttatcag agatgacgga	1268
accgtcaaag tgagccgctc gctgaaagaa ctcggcaaca aaatccggcg ggcgaaagac	1328
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<211> 146

<212> PRT

<213> Bacillus licheniformis

<400> 173

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Ser Phe Ala Arg Val Thr Val Ala Ala Phe Ile Ala Gln Leu Asp Pro 20 25 30

Thr Met Asp Glu Leu Thr Glu Ile Lys Thr Val Val Ser Glu Ala Val 35 40 45

Thr Asn Ala Ile Ile His Gly Tyr Glu Asn Ser Gly Gln Gly Asn Val
50 60

Tyr Ile Ser Val Thr Leu Glu Asp His Ile Val Tyr Leu Thr Ile Arg 65 70 75 80

Asp Glu Gly Val Gly Ile Pro Asn Leu Glu Glu Ala Arg Gln Pro Leu 85 90 95

Phe Thr Thr Lys Pro Glu Leu Glu Arg Ser Gly Met Gly Phe Thr Ile 100 105 110

Met Glu Asn Phe Met Asp Asp Ile Ser Ile Asp Ser Ser Pro Glu Met 115 120 125

Gly Thr Thr Ile His Leu Thr Lys His Leu Ser Lys Ser Lys Ala Leu 130 135 140

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Cys Asn 145

<210> 174

<211> 5482

<212> DNA

<213> Bacillus licheniformis

<220>

<221> CDS <222> (501)..(4982)

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Gly 140	Gln	Trp	Asn	Val	Leu 145	Pro	Asn	Asp	Ala	Lys 150	Ile	Tyr	Leu	Asn	Gly 155	
												gac Asp				1013
												ctc Leu				1063
												att Ile 200				1109
												agg Arg				1157
atg Met 220	att Ile	tac Tyr	gac Asp	ctg Leu	ccg Pro 225	gat Asp	gaa Glu	aaa Lys	gta Val	tcc Ser 230	ttc Phe	agc Ser	ttc Phe	ccg Pro	gca Ala 235	1205
												atg Met				1253
												ctc Leu				1301
cgg Arg	Gly 999	atc Ile 270	ttt Phe	atc Ile	atc Ile	gtt Val	tcc Ser 275	ctt Leu	gcg Ala	atg Met	ttt Phe	atg Met 280	atg Met	acg Thr	ctg Leu	1349
												cag Gln				139'
aga Arg 300	gaa Glu	gaa Glu	aaa Lys	aga Arg	gag Glu 305	cgg Arg	gtc Val	tat Tyr	acc Thr	ctt Leu 310	tac Tyr	ctt Leu	gaa Glu	aac Asn	aaa Lys 315	144!
aag Lys	aaa Lys	gag Glu	ctg Leu	cat His 320	gaa Glu	ctt Leu	gca Ala	gaa Glu	aga Arg 325	caa Gln	aag Lys	ttc Phe	gta Val	ctt Leu 330	gat Asp	149
												aca Thr				154
agc Ser	gga Gly	cga Arg 350	att Ile	tgg Trp	gaa Glu	aaa Lys	tcg Ser 355	att Ile	gaa Glu	agc Ser	gcc Ala	gat Asp 360	ttt Phe	ctg Leu	caa Gln	158:
atc Ile	cgc Arg	ctt Leu	gga Gly	acg Thr	gga Gly	aat Asn	gtt Val	gca Ala	tct Ser	tcg Ser	tac Tyr	caa Gln	atc Ile	aat Asn	ttg Leu	163

365 370 375

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						gtc Val											1733
						ggc Gly											1781
						cat His											1829
						cgc Arg 450											1877
						atg Met											1925
						ttt Phe											1973
						gag Glu										:	2021
						ttt Phe										:	2069
						gaa Glu 530										:	2117
						gtg Val										:	2165
						att Ile										i	2213
						atc Ile										:	2261
ttt Phe	cag Gln	ctg Leu 590	gat Asp	cac His	cac His	aac Asn	agg Arg 595	gaa Glu	gac Asp	aac Asn	gaa Glu	cag Gln 600	ttt Phe	tcc Ser	cgg Arg	,	2309

					gac Asp											2357
_		_	_		ctc Leu 625	_	_				_	_	_	-		2405
					aaa Lys											2453
_		_			tat Tyr				_	_		_				2501
		_	_		cac His					_		_				2549
	_			_	gaa Glu		_	_				_		_	_	2597
_				_	cat His 705	_	_	_		_			_			2645
			_		cag Gln	_					_		_			2693
_					gaa Glu		_	_			-					2741
			_	_	gag Glu	_	_			_				_	_	2789
					atc Ile		_			_				_		2837
	703															
	gcg				atg Met 785	ccg										2885
Lys 780 gcc	gcg Ala gag	Lys	Thr	Ala agc	Met	ccg Pro	His ccg	Leu gaa	Phe ttt	Leu 790 atc	Ile cgc	Ser gag	Asp ctt	Glu gtc	Phe 795 agt	2885

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				ttg Leu												3077
ctc Leu 860	aaa Lys	aac Asn	gly ggg	gat Asp	gcg Ala 865	gct Ala	acc Thr	atc Ile	acg Thr	gta Val 870	acg Thr	ggc Gly	cgc Arg	ggc Gly	tat Tyr 875	3125
ttg Leu	caa Gln	gtc Val	ggc Gly	aac Asn 880	aac Asn	gag Glu	gtg Val	tat Tyr	gaa Glu 885	ctg Leu	ttc Phe	cag Gln	tct Ser	gca Ala 890	tgg Trp	3173
				tac Tyr												3221
				gat Asp												3269
gat Asp	cgc Arg 925	gct Ala	gcg Ala	aaa Lys	aaa Lys	gag Glu 930	gct Ala	gtg Val	acg Thr	gaa Glu	att Ile 935	tcg Ser	gca Ala	gtc Val	gtc Val	3317
				cgg Arg											ccg Pro 955	3365
				ccg Pro 960											Tyr	3413
ccg Pro	tcg Ser	gag Glu	gaa Glu 975	gcc Ala	gat Asp	gcc Ala	ttt Phe	aac Asn 980	ttt Phe	gcc Ala	tat Tyr	atc Ile	gat Asp 985	gaa Glu	cct Pro	3461
gaa Glu	aag Lys	caa Gln 990	agc Ser	cag Gln	gag Glu	ccg Pro	atc Ile 995	agc Ser	tac Tyr	cgc Arg	atg Met	atg Met 100	Gl	a ga u As	c ggc p Gly	3509
aat Asn	atc Ile 1005	Gly	c ato	c gto e Va.	ggo L Gly	y Ser 10:	r S	ca g er G	gc to ly T	ac g yr G	ly L	aa ys 015	tcc Ser			3554
_	acg Thr 1020	Thi		c ato			r P				ln T		acg Thr	_		3599
_	ttg Leu 1035	His		c tac r Ty			e A				sn G		acg Thr			3644
ccg	ctt	gca	a ag	g cti	cci	g ca	c a	cc g	cg g	at t	at t	tc	ctg	atg	gac	3689

Pro	Leu 1050		Arg	Leu	Pro	His 1055		Ala	Asp	Tyr	Phe 1060	Leu	Met	Asp	
	acg Thr 1065	_				aaa Lys 1070	Phe	_	_						3734
						ctc Leu 1085		_	_		-				3779
	aag Lys 1095					ctg Leu 1100									3824
_	ata Ile 1110					ttt Phe 1115									3869
	ctc Leu 1125					atc Ile 1130									3914
	gga Gly 1140					ctg Leu 1145	Thr				-		_		3959
_	cag Gln 1155	_		_		aac Asn 1160	_		_		_	_			4004
						gca Ala 1175									4049
						cct Pro 1190									4094
	caa Gln 1200					atg Met 1205									4139
						999 Gly 1220									4184
						atg Met 1235									4229
_	_					gtc Val 1250		_			_	_			4274
						ctt Leu									4319

	1260					1265					1270				
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	att Ile 1290	atg Met	ggt Gly	cag Gln	acg Thr	cag Gln 1295	cgc Arg	gga Gly	aaa Lys	aca Thr	aac Asn 1300	gtc Val	atc Ile	aag Lys	4409
atc Ile	atg Met 1305	ctc Leu	gag Glu	cac His	ctg Leu	ctt Leu 1310	gac Asp	cat His	gac Asp	acg Thr	aaa Lys 1315	aaa Lys	atc Ile	gcc Ala	4454
gtg Val	ttt Phe 1320	gat Asp	tcg Ser	ata Ile	gac Asp	aga Arg 1325	ggg Gly	ctt Leu	tct Ser	caa Gln	tat Tyr 1330	gcg Ala	aca Thr	gag Glu	4499
											att Ile 1345				4544
											gaa Glu 1360				4589
ttg Leu	gaa Glu 1365	gcc Ala	gtt Val	aaa Lys	caa Gln	gga Gly 1370	gaa Glu	atc Ile	gcc Ala	aac Asn	ctt Leu 1375	gat Asp	ttc Phe	tca Ser	4634
ccg Pro	atg Met 1380	gtc Val	ttt Phe	att Ile	gtc Val	gac Asp 1385	gga Gly	att Ile	tca Ser	cgg Arg	ttc Phe 1390	cag Gln	cag Gln	acg Thr	4679
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											gga Gly 1420			agc Ser	4769
gag Glu	ttc Phe 1425	aca Thr	aaa Lys	ggc Gly	tat Tyr	gat Asp 1430	tcg Ser	ctg Leu	aca Thr	agc Ser	gaa Glu 1435	gtc Val	aag Lys	cag Gln	4814
gtc Val	aga Arg 1440	cac His	gcg Ala	atg Met	cta Leu	ttg Leu 1445	atg Met	aaa Lys	aaa Lys	tcc Ser	gag Glu 1450	cag Gln	aac Asn	ttg Leu	4859
att Ile	cag Gln 1455	ctc Leu	cca Pro	tat Tyr	gaa Glu	cgc Arg 1460	cag Gln	gag Glu	ccg Pro	gaa Glu	att Ile 1465	ctg Leu	ccg Pro	ggc Gly	4904
ttt Phe	ggc Gly 1470	tat Tyr	atc Ile	gtt Val	gaa Glu	aac Asn 1475	ggc Gly	aaa Lys	gag Glu	agg Arg	aaa Lys 1480	att Ile	caa Gln	att Ile	4949

cct tta tgt gct gta gaa agg aag aaa Pro Leu Cys Ala Val Glu Arg Lys Lys 1485 1490	_ •
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<211> 1494

<212> PRT

<213> Bacillus licheniformis

<400> 175

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His Ser Val Thr Ile Lys His Phe Ser Phe Glu Lys Gly Pro Val Thr 35 40 45

Leu Glu Lys Gln Lys Asp Ser Asp Ala Leu Asn Val Gln Leu Gly Gly 50 55 60

Glu Thr Val Ser Ser Leu Lys Leu Gly Gly Lys Ala Ser Val Gln Ser 65 70 75 80

Gly Ala Glu Gln Leu Thr Leu Phe Leu Ala Glu Glu Ala Asp Ser Val 85 90 95

Pro Ala Tyr Tyr Leu Gly Glu Arg Gln Glu Ile Val Ile Ser Ser Leu 100 105 110

Asp	Gln	Glu 115	Ala	Asp	Val	Tyr	Phe 120	Asn	Glu	Thr	Asp	Ser 125	Phe	Phe	Gly
Glu	Lys 130	Gly	Thr	Phe	Ser	Phe 135	Ile	Arg	Leu	Asp	Gly 140	Gln	Trp	Asn	Val
Leu 145	Pro	Asn	Asp	Ala	Lys 150	Ile	Tyr	Leu	Asn	Gly 155	Glu	Glu	Val	Ser	Ala 160
Pro	Val	Ser	Val	Gln 165	Asn	Gly	Asp	Glu	Ile 170	Ala	Phe	Gly	Leu	Asn 175	Ile
Leu	Arg	Ile	Val 180	Glu	Asp	Asp	Leu	Leu 185	Glu	Ile	Glu	Gly	Phe 190	Gly	Lys
Phe	Asp	Thr 195	Ser	Leu	Glu	Asn	Ile 200	Leu	Lys	Pro	Ser	Ser 205	Glu	Thr	Lys
Asn	Lys 210	Tyr	Pro	Gln	Tyr	Arg 215	Arg	Pro	Pro	Arg	Met 220	Ile	Tyr	Asp	Leu
Pro 225	Asp	Glu	Lys	Val	Ser 230	Phe	Ser	Phe	Pro	Ala 235	Gln	Glu	Ser	Asp	Gly 240
Asp	Asn	Arg	Gly	Leu 245	Trp	Leu	Met	Ile	Leu 250	Pro	Pro	Leu	Val	Met 255	Leu
Ile	Val	Met	Gly 260	Ile	Val	Ala	Leu	Ile 265	Gln	Pro	Arg	Gly	Ile 270	Phe	Ile
Ile	Val	Ser 275	Leu	Ala	Met	Phe	Met 280	Met	Thr	Leu	Ile	Thr 285	Ser	Thr	Val
Gln	Tyr 290	Phe	Arg	Asp	Lys	Asn 295	Glņ	Arg	Lys	Lys	Arg 300	Glu	Glu	Lys	Arg
Glu 305	Arg	Val	Tyr	Thr	Leu 310	Tyr	Leu	Glu	Asn	Lys 315	Lys	Lys	Glu	Leu	His 320
Glu	Leu	Ala	Glu	Arg 325	Gln	Lys	Phe	Val	Leu 330	Asp	Phe	His	Phe	Pro 335	Thr

Phe	Glu	Arg	Met 340	Lys	Tyr	Leu	Thr	Lys 345	Glu	Ile	Ser	Gly	Arg 350	Ile	Trp
Glu	Lys	Ser 355	Ile	Glu	Ser	Ala	Asp 360	Phe	Leu	Gln	Ile	Arg 365	Leu	Gly	Thr
Gly	Asn 370	Val	Ala	Ser	Ser	Tyr 375	Gln	Ile	Asn	Leu	Asn 380	Gly	Gly	Asp	Leu
Ala 385	Asn	Arg	Asp	Thr	Asp 390	His	Leu	Leu	Glu	Gln 395	Thr	Gln	Lys	Met	Glu 400
Glu	Val	Tyr	Arg	Glu 405	Leu	Lys	Asn	Ala	Pro 410	Ile	Thr	Val	Asn	Leu 415	Ala
Glu	Gly	Pro	Met 420	Gly	Val	Val	Gly	Lys 425	Leu	Ser	Val	Val	Lys 430	Asn	Glu
Ile	His	Gln 435	Leu	Val	Gly	Gln	Leu 440	Ala	Phe	Phe	His	Ser 445	Tyr	His	Asp
Leu	Arg 450	Phe	Val	Phe	Ile	Phe 455	Asp	Glu	Ala	Glu	Tyr 460	Gln	Glu	Trp	Glu
Trp 465	Met	Lys	Trp	Leu	Pro 470	His	Phe	Gln	Met	Pro 475	His	Ile	Tyr	Ala	Lys 480
Gly	Phe	Ile	Tyr	Asn 485	Glu	Gln	Thr	Arg	Asp 490	Gln	Leu	Leu	Ser	Ser 495	Ile
Tyr	Glu	Ile	Leu 500	Arg	Glu	Arg	Asp	Leu 505	Asp	Glu	Asn	Lys	Lys 510	Lys	Thr
Leu	Phe	Lys 515	Pro	His	Phe	Val	Phe 520	Ile	Ile	Thr	Asn	Gln 525	Gln	Leu	Ile
Ala	Glu 530	His	Val	Ile	Leu	Glu 535	Tyr	Leu	Glu	Gly	Lys 540	Gln	Lys	His	Leu
Gly 545	Val	Ser	Thr	Ile	Val 550	Ala	Ala	Glu	Thr	Lys 555	Glu	Ser	Leu	Ser	Glu 560

Asn	Ile	His	Thr	Leu 565	Val	Arg	Tyr	Ile	Thr 570	Glu	Gln	Glu	Gly	Asp 575	Ile
Leu	Ile	Lys	Gln 580	Lys	Lys	Ala	Val	Gln 585	Ile	Pro	Phe	Gln	Leu 590	Asp	His
His	Asn	Arg 595	Glu	Asp	Asn	Glu	Gln 600	Phe	Ser	Arg	Thr	Leu 605	Arg	Thr	Leu
Asp	His 610	Gln	Thr	Gly	Met	Thr 615	Asn	Ser	Ile	Pro	Asp 620	Thr	Val	Ser	Phe
Leu 625	Glu	Leu	Phe	Gln	Val 630	Lys	Glu	Val	Asp	Asp 635	Ile	Gly	Ile	Glu	Gln 640
Lys	Trp	Met	Thr	Ser 645	Glu	Ser	Ala	Lys	Ser 650	Leu	Ala	Val	Pro	Ile 655	Gly
Tyr	Lys	Gly	Lys 660	Asp	Asp	Ile	Val	Tyr 665	Leu	Asn	Leu	His	Glu 670	Lys	Ala
His	Gly	Pro 675	His	Gly	Leu	Leu	Ala 680	Gly	Thr	Thr	Gly	Ser 685	Gly	Lys	Ser
Glu	Phe 690	Leu	Gln	Thr	Tyr	Ile 695	Leu	Ser	Leu	Ala	Val 700	His	Phe	His	Pro
His 705	Glu	Val	Ala	Phe	Leu 710	Leu	Ile	Asp	Tyr	Lys 715	Gly	Gly	Gly	Met	Ala 720
Gln	Pro	Phe	Arg	Asn 725	Ile	Pro	His	Leu	Leu 730	Gly	Thr	Ile	Thr	Asn 735	Ile
Glu	Gly	Ser	Lys 740	Asn	Phe	Ser	Asn	Arg 745	Ala	Leu	Ala	Ser	Ile 750	Lys	Ser
Glu	Leu	Lys 755	Lys	Arg	Gln	Arg	Leu 760	Phe	Asp	Gln	Tyr	Lys 765	Val	Asn	His
Ile	Asn 770	Asp	Tyr	Thr	Lys	Leu 775	Tyr	Lys	Gln	Lys	Lys 780	Ala	Lys	Thr	Ala
Met	Pro	His	Leu	Phe	Leu	Ile	Ser	Asp	Glu	Phe	Ala	Glu	Leu	Lys	Ser

785	790	795	800

Glu Glu Pro Glu Phe Ile Arg Glu Leu Val Ser Ala Ala Arg Ile Gly 805 810 815

Arg Ser Leu Gly Val His Leu Ile Leu Ala Thr Gln Lys Pro Gly Gly 820 825 830

Ile Ile Asp Asp Gln Ile Trp Ser Asn Ser Arg Phe Lys Val Ala Leu 835 840 845

Lys Val Gln Asp Ala Asn Asp Ser Lys Glu Ile Leu Lys Asn Gly Asp 850 855 860

Ala Ala Thr Ile Thr Val Thr Gly Arg Gly Tyr Leu Gln Val Gly Asn 865 870 875 880

Asn Glu Val Tyr Glu Leu Phe Gln Ser Ala Trp Ser Gly Ala Pro Tyr 885 890 895

Met Glu Asp Gly Tyr Gly Thr Glu Asp Glu Val Ala Ile Val Thr Asp 900 905 910

Thr Gly Leu Ile Pro Leu Ser Asp Val Asp Ala Asp Arg Ala Ala Lys 915 920 925

Lys Glu Ala Val Thr Glu Ile Ser Ala Val Val Glu Gln Ile Glu Arg 930 935 940

Ile Gln Ala Glu Met Gly Ile Glu Lys Leu Pro Ser Pro Trp Leu Pro 945 950 955 960

Pro Leu Glu Glu Arg Ile Pro Lys Thr Arg Tyr Pro Ser Glu Glu Ala 965 970 975

Asp Ala Phe Asn Phe Ala Tyr Ile Asp Glu Pro Glu Lys Gln Ser Gln 980 985 990

Glu Pro Ile Ser Tyr Arg Met Met Glu Asp Gly Asn Ile Gly Ile Val 995 1000 1005

Gly Ser Ser Gly Tyr Gly Lys Ser Leu Thr Ala Thr Thr Phe Met 1010 1015 1020

Met Ser Phe Ala Glu Gln Tyr Thr Pro Glu Glu Leu His Tyr Tyr Ile Phe Asp Phe Gly Asn Gly Thr Leu Leu Pro Leu Ala Arg Leu Pro His Thr Ala Asp Tyr Phe Leu Met Asp Gln Thr Arg Lys Ile Glu Lys Phe Met Val Arg Ile Lys Ala Glu Ile Glu His Arg Lys Asn Leu Phe Arg Ala Lys Glu Ile Ser His Ile Lys Met Tyr Asn Ala Leu Asn Glu Glu Lys Leu Pro Phe Ile Phe Ile Thr Val Asp Asn Phe Asp Ile Ile Lys Asp Glu Met His Glu Leu Glu Ser Glu Phe Ile Gln Phe Ser Arg Asp Gly Gln Ser Leu Gly Ile Tyr Leu Ile Leu Thr Ala Thr Arg Val Asn Ala Ile Arg Gln Ser Leu Leu Asn Asn Leu Lys Thr Arg Val Val His Tyr Leu Met Asp Gln Ser Glu Ala Tyr Ser Ile Ile Gly Arg Pro Glu Phe Ser Leu Glu Pro Ile Pro Gly Arg Val Ile Ile Asn Lys Glu Asn Gln Tyr Phe Ala Gln Met Phe Met Pro Val Glu Ala Asp Asn Asp Ile Glu Leu Phe Glu Gly Ile Lys Ala Asp Ile Gln Ala Ile Ala Glu Arg Ser Glu

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Ala Gly Gln Thr Phe Ile Tyr Met Phe Arg Phe Phe Ala Gly Glu Trp

45 50 55

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	_	_			-			_	_	gat Asp	_			_	1301
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						gat Asp					1445
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						gaa Glu					1541
						cat His 355					1589
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						aaa Lys					1781
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						ctc Leu					2021

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	_	_			-		ctg Leu 675		_	_	_	_	_		-	2549
							caa Gln									2597
		_		_	_	_	acg Thr	_	_	-			_	_		2645
							gtg Val									2693
tcc	atg	ctg	caa	agg	aga	ttc	cgc	atc	ggc	tat	aca	aga	gcg	gcg	cgg	2741

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Arg	Gly	Met 115	Val	Gln	Ser	Pro	Ser 120	Val	Ile	Gln	Asn	Thr 125	Trp	Glu	Leu
Phe	Leu 130	Met	Asp	Val	Lys	Gly 135	Glu	Thr	Gly	Ser	Pro 140	Asp	Leu	Gly	Gly
Gly 145	Met	Ile	Gly	Ala	Leu 150	Leu	Phe	Ala	Ala	Ser 155	Tyr	Phe	Leu	Phe	Ala 160
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Thr	Pro	Val 195	Ala	Ser	Phe	Met	Lys 200	Asn	Gln	Trp	Gln	Ala 205	Phe	Leu	Ala
Asp	Leu 210	Lys	Gln	Leu	Lys	Asn 215	Ser	Ser	Pro	Lys	Lys 220	Lys	Ser	Gly	Lys
Lys 225	Gln	Lys	Thr	Gln	Arg 230	Lys	Pro	Lys	Val	Ser 235	Glu	Glu	Pro	Val	Gln 240
Glu	Ala	Asp	Leu	Asp 245	Pro	Asp	Pro	Val	Ile 250	Gln	Ser	Glu	Pro	Ile 255	Ile
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Ala	Pro	Ala 275	Ala	Pro	Ala	Glu	Pro 280	Pro	Ala	Glu	Pro	Glu 285	Ile	Gly	Glu
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His	Thr	Gly	Gln	Gln 325	Ala	Asp	Lys	Lys	Asn 330	Ile	Tyr	Asp	Asn	Ala 335	Arg
Lys	Leu	Glu	Arg 340	Thr	Phe	Gln	Ser	Phe 345	Gly	Val	Lys	Ala	Lys 350	Val	Thr
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Val	Gly 370	Val	Lys	Val	Ser	Lys 375	Ile	Val	Asn	Leu	Ser 380	Asp	Asp	Leu	Ala
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Lys	Leu	Met 435	Ile	Gly	Leu	Gly	Arg 440	Asn	Ile	Ser	Gly	Glu 445	Ala	Val	Leu
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Val	Glu	Leu	Asn 500	Val	Tyr	Asn	Gly	Ile 505	Pro	His	Leu	Leu	Ala 510	Pro	Val
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Ala	Lys	Gln	Pro	Glu 565	Leu	Pro	Tyr	Ile	Ile 570	Val	Ile	Val	Asp	Glu 575	Leu
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Thr	Gln 610	Arg	Pro	Ser	Val	Asp 615	Val	Ile	Thr	Gly	Val 620	Ile	Lys	Ala	Asn
Ile 625	Pro	Ser	Arg	Ile	Ala 630	Phe	Ser	Val	Ser	Ser 635	Gln	Thr	Asp	Ser	Arg 640
Thr	·Ile	Leu	Asp	Met 645	Gly	Gly	Ala	Glu	Lys 650	Leu	Leu	Gly	Arg	Gly 655	Asp
Met	Leu	Phe	Leu 660	Pro	Val	Gly	Ala	Asn 665	Lys	Pro	Leu	Arg	Val 670	Gln	Gly
Ala	Phe	Leu 675	Ser	Asp	Glu	Glu	Val 680	Glu	Lys	Val	Val	Asp 685	His	Val	Ile
Ser	Gln 690	Gln	Lys	Ala	Gln	Tyr 695	Gln	Glu	Glu	Met	Ile 700	Pro	Glu	Glu	Thr
Gln 705	Glu	Thr	Val	Ser	Glu 710	Val	Thr	Asp	Asp	Leu 715	Tyr	Asp	Glu	Ala	Val 720
Ala	Leu	Val	Val	Ser 725	Met	Gln	Thr	Ala	Ser 730	Val	Ser	Met	Leu	Gln 735	Arg
Arg	Phe	Arg	Ile 740	Gly	Tyr	Thr	Arg	Ala 745	Ala	Arg	Leu	Ile	Asp 750	Ala	Met
Glu	Glu	Arg	Gly	Ile	Val	Gly	Pro	Tyr	Glu	Gly	Ser	Lys	Pro	Arg	Glu

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Leu Arg Phe Arg Glu His Thr Val Lys Ser Ala Arg Glu Leu Ile Asn 50 55 60

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Phe Trp Arg Val Thr Pro Glu Gly Ala Leu Glu Leu Lys Tyr Arg Ala 85 90 95

Pro Ala Ser Lys Ala Ile Arg Asn Ile Phe Glu Ser Gly Pro Ser Tyr 100 105 110

Ala Phe Glu Cys Ala Thr Ala Ile Val Ile Ile Phe Tyr Met Ala Leu 115 120 125

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Ile Leu Tyr Asp Trp His Tyr Glu Arg Leu Pro Ile Tyr Thr Asp Lys
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195 200 205

Thr Ile Ile Glu Lys Leu Asn Gly Leu Arg Lys Pro His Ala Gln Thr 210 215 220	
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Met Lys Gln Phe Val Asp Asp Pro Phe Leu Leu Tyr Asp Glu Thr Leu 20 25 30

Pro Ile Asp Leu Tyr Glu Thr Ser Thr Glu Tyr Ile Ile Glu Ala Asp 35 40 45

Leu Ser His Leu Asn Val Arg His Leu Asp Leu Thr Phe Ser Gly Tyr 50 Asp Phe Lys Leu Ala Val Lys Thr Asp Glu Gln Leu Tyr Glu Lys Ser Leu Met Leu Pro Phe Phe Leu Asn Asp Lys Gln Ile Glu Ala Glu Cys Glu Asn Asn Ile Leu Ala Val Lys Ile Asn Lys Glu Ser Ser Lys Asp 100 105 Asp Ile Ser Leu Ser Ile Asn Ile Pro Phe Ile Ser Asn Leu His Asn 115 120 125 Lys Gln Asn Pro Asp Ser Ala 130 135 <210> 182 <211> 2155 <212> DNA <213> Bacillus licheniformis <220> <221> CDS <222> (501)..(1655) <400> 182 aaaggttttc agaaagcttc ggcgtttctt ttgatgagct gatgacagcg gccggctatg 60 cgatggagaa gacgcaggaa agcgaacgtc cggatattca ctcgtcagtt gccgaaattg 120 aagatgtttt gcaaacctca aatgtctatg atcggccatt taccatggaa gaactgaaaa 180 acaaattgaa tgagtgcgaa caatattctc agacggagga aggaaagcgt accattctqq 240 ctgagtttga atctaaaatc gagaaagttg ccggcattgg tccttttctg acccgtctgc 300 acgacatgta cagcagattt acctcggggc gggggacgcc gcgtgaattg ctgctgatgg 360 gcggcgcttt gctgtatttc atcgtttctg ttgatgtcat accggattat atttttccga 420 teggetatat egatgatgeg geageggtte atttegtttt caaccagetg teatataaat 480 catgatggag catgttcaag atg aaa aga aag cat atc aac att gac atc agt 533 Met Lys Arg Lys His Ile Asn Ile Asp Ile Ser

					ttt Phe											581
					cag Gln											629
aaa Lys	cgg Arg 45	cag Gln	gtc Val	ttt Phe	tgg Trp	tat Tyr 50	ctt Leu	gtc Val	gly ggg	ttt Phe	ggc Gly 55	gtc Val	atg Met	gcg Ala	gga Gly	677
					tat Tyr 65											725
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					caa Gln											821
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					cag Gln											917
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					gat Asp											1013
					ctg Leu											1061
					ttc Phe											1109
					gag Glu											1157
ctt Leu 220	gac Asp	cgg Arg	ata Ile	tat Tyr	ggc Gly 225	tgg Trp	ctc Leu	agt Ser	cct Pro	cat His 230	gaa Glu	cat His	gcc Ala	tct Ser	aca Thr 235	1205
tat	gga	tac	cag	ctg	acg	cag	gcg	tta	ttg	ggg	atc	gga	tca	ggc	cag	1253

Tyr Gly Tyr Gln Leu Thr Gln Ala Leu 240	Leu Gly Ile Gly Ser Gly Gln 245 250	
ctg tca ggg agc ggc ttt act caa gga Leu Ser Gly Ser Gly Phe Thr Gln Gly 255 260	lle Gln Val Gln Gly Gly Lys	01
att ccg gag gct cat act gat ttt att Ile Pro Glu Ala His Thr Asp Phe Ile 270 275		49
ttc ggt ttt ttg ggt gcc gta aca tta Phe Gly Phe Leu Gly Ala Val Thr Leu 285 290		97
atc tac aga atc atc agg att gcg ctt Ile Tyr Arg Ile Ile Arg Ile Ala Leu 300 305		45
ctt tat ata tgt gcg ggg gtt gca ggg Leu Tyr Ile Cys Ala Gly Val Ala Gly 320		93
caa aat atc ggg atg acg atc ggg tta Gln Asn Ile Gly Met Thr Ile Gly Leu 335 340	Met Pro Ile Thr Gly Leu Ala	41
ctt ccg ttt atc agc tat ggc ggc agc Leu Pro Phe Ile Ser Tyr Gly Gly Ser 350 355		39
gct tta ggt ctc gtt ttc agt gtg aat Ala Leu Gly Leu Val Phe Ser Val Asn 365 370		37
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<212> PRT

<213> Bacillus licheniformis

<400> 183

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Phe Cys Leu Phe Ile Ile Ser Leu Leu Ala Val Tyr Ser Gly Ser Gly 20 25 30

Gln Tyr Glu Thr Gln Asp Pro Phe Tyr Phe Ala Lys Arg Gln Val Phe 35 40 45

Trp Tyr Leu Val Gly Phe Gly Val Met Ala Gly Thr Ala Tyr Ile Asp 50 55 60

Tyr Glu Leu Leu Glu Arg Leu Ala Leu Arg Leu Phe Val Gly Ala Val 65 70 75 80

Phe Leu Leu Ile Leu Val His Phe Phe Gly Thr Tyr Lys Asn Gly Ser 85 90 95

Gln Arg Trp Ile Ser Phe Gly Val Ile Glu Ile Gln Pro Ser Glu Phe 100 105 110

Met Lys Ile Ile Leu Ile Leu Leu Leu Ala Ser Ile Leu Asn Gln Phe 115 120 125

Gln His Lys Arg Phe Ser Phe Ala Glu Ser Ile Ile Pro Thr Gly Lys 130 135 140

-Asp Leu Gly Ser Ala Leu Val Ile Leu Ser Ile Ala Phe Thr Leu Met 165 170 175

Leu Val Ser Gly Ile Ser Gly Arg Met Ile Val Ser Leu Ser Leu Gly 180 185 190

Phe Met Ala Leu Val Ala Phe Leu Thr Tyr Leu His Asn His Tyr Phe 195 200 205 Glu Ile Phe Ser Lys Ile Ile Lys Pro His Gln Leu Asp Arg Ile Tyr 215 210 Gly Trp Leu Ser Pro His Glu His Ala Ser Thr Tyr Gly Tyr Gln Leu 235 225 230 Thr Gln Ala Leu Leu Gly Ile Gly Ser Gly Gln Leu Ser Gly Ser Gly 250 245 Phe Thr Gln Gly Ile Gln Val Gln Gly Gly Lys Ile Pro Glu Ala His 260 265 Thr Asp Phe Ile Phe Ala Val Ile Gly Glu Glu Phe Gly Phe Leu Gly Ala Val Thr Leu Val Cys Leu Tyr Phe Leu Met Ile Tyr Arg Ile Ile 295 Arg Ile Ala Leu Ser Ser Asn Ser Leu Phe Gly Leu Tyr Ile Cys Ala 310 315 305 Gly Val Ala Gly Leu Ile Val Phe Gln Val Phe Gln Asn Ile Gly Met 330 325 Thr Ile Gly Leu Met Pro Ile Thr Gly Leu Ala Leu Pro Phe Ile Ser 350 340 345 Tyr Gly Gly Ser Ala Leu Leu Thr Asn Met Ile Ala Leu Gly Leu Val 355 360 Phe Ser Val Asn Ile Arg Ser Lys His Tyr Met Phe Gly Asn Asp Trp 370 375 380 Gly 385 <210> 184 <211> 2113 <212> DNA <213> Bacillus licheniformis

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taaacgtgtc gataatgttg aacaagcagc aactgcggcg ttcagcctgt cagacgaagg	360
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acgtggtgac atgtttgtaa acgccgtgca tatgcttaaa taagggcttg tctcgtaaag	480
atagccctaa gaattagagc ttg ggg tgt tcg gct ttg caa aca aaa aaa acg Leu Gly Cys Ser Ala Leu Gln Thr Lys Lys Thr 1 5 10	533
tca ccg gat ttt ttg ctg gtt atc att acg cta ttg ctt tta aca atc Ser Pro Asp Phe Leu Leu Val Ile Ile Thr Leu Leu Leu Thr Ile 15 20 25	581
gga ctg att atg gta tac agc gcc agt gca gta tgg gcg act tac aaa Gly Leu Ile Met Val Tyr Ser Ala Ser Ala Val Trp Ala Thr Tyr Lys 30 35 40	629
tac gac gac tcc ttt ttc ttt gcg aaa cgg cag ctt ttg ttt gcc ggc Tyr Asp Asp Ser Phe Phe Phe Ala Lys Arg Gln Leu Leu Phe Ala Gly 45 50 55	677
atc ggg gtc atc gcc atg ttt ttc atc atg aac gtc gac tac tgg acg Ile Gly Val Ile Ala Met Phe Phe Ile Met Asn Val Asp Tyr Trp Thr 60 75	725
tgg agg act tat gcg aaa ata ctg atc att gta tgt ttc ttt ctg ctc Trp Arg Thr Tyr Ala Lys Ile Leu Ile Ile Val Cys Phe Phe Leu Leu 80 85 90	773
atc atc gtc ctg gtt ccc ggg atc ggc atg gaa cgg aac ggg tcg agg Ile Ile Val Leu Val Pro Gly Ile Gly Met Glu Arg Asn Gly Ser Arg 95 100 105	821
agc tgg atc gga gtc ggc gct ttc agc att cag ccg tcc gag ttt atg Ser Trp Ile Gly Val Gly Ala Phe Ser Ile Gln Pro Ser Glu Phe Met 110 115 120	869
aaa ctc gcg atg atc gca ttt ttg gcc aag ttt tta tct gaa aag caa Lys Leu Ala Met Ile Ala Phe Leu Ala Lys Phe Leu Ser Glu Lys Gln 125 130 135	917
aag aat att acg tcg ttt aga aaa ggc ttt gtg ccg gcg ctg ggc att Lys Asn Ile Thr Ser Phe Arg Lys Gly Phe Val Pro Ala Leu Gly Ile	965

140				145					150					155	
				ctg Leu											1013
				ggc Gly											1061
	_		_	ttc Phe	_				_			_	_		1109
	_			 ctg Leu	_		_								1157
		_		tgg Trp 225		_				_					1205
				gcg Ala											1253
		_	_	 caa Gln	_				_				_		1301
				att Ile											1349
				ctc Leu											1397
				ccc Pro 305											1445
				gcg Ala											1493
				gtt Val											1541
				acc Thr											1589
		_		tct Ser	_		taga	tttt	gg d	gata	acco	et gt	tgcg	gagat	1643

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aagaattaaa	acggttcaag	ccggatgccg	tgatcggcac	gggcggctac	gtgtgcggcc	2003
ccgtcgtata	cgccgcttca	aaactgggga	ttccgacgat	tatccacgaa	caaaacagcc	2063
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<211> 371

<212> PRT

<213> Bacillus licheniformis

<400> 185

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Tyr Ser Ala Ser Ala Val Trp Ala Thr Tyr Lys Tyr Asp Asp Ser Phe 35 40 45

Phe Phe Ala Lys Arg Gln Leu Leu Phe Ala Gly Ile Gly Val Ile Ala 50 55 60

Met Phe Phe Ile Met Asn Val Asp Tyr Trp Thr Trp Arg Thr Tyr Ala 65 70 75 80

Lys Ile Leu Ile Ile Val Cys Phe Phe Leu Leu Ile Ile Val Leu Val 85 90 95

Pro Gly Ile Gly Met Glu Arg Asn Gly Ser Arg Ser Trp Ile Gly Val 100 105 110

Gly Ala Phe Ser Ile Gln Pro Ser Glu Phe Met Lys Leu Ala Met Ile 115 120 125

Ala Phe Leu Ala Lys Phe Leu Ser Glu Lys Gln Lys Asn Ile Thr Ser Phe Arg Lys Gly Phe Val Pro Ala Leu Gly Ile Val Phe Ser Ala Phe Leu Ile Ile Met Met Gln Pro Asp Leu Gly Thr Gly Thr Val Met Val Gly Thr Cys Ile Ile Met Ile Phe Val Ala Gly Ala Arg Ile Ser His Phe Val Phe Leu Gly Leu Ile Gly Leu Ser Gly Phe Val Gly Leu Val Leu Ser Ala Pro Tyr Arg Ile Lys Arg Ile Thr Ser Tyr Leu Asn Pro Trp Glu Asp Pro Leu Gly Ser Gly Phe Gln Ile Ile Gln Ser Leu Tyr Ala Val Gly Pro Gly Gly Leu Phe Gly Leu Gly Leu Gly Gln Ser Arg Gln Lys Phe Phe Tyr Leu Pro Glu Pro Gln Thr Asp Phe Ile Phe Ala Ile Leu Ser Glu Glu Leu Gly Phe Ile Gly Gly Ser Leu Ile Leu Leu Leu Phe Ser Val Leu Leu Trp Arg Gly Ile Arg Ile Ala Leu Gly Ala Pro Asp Leu Tyr Gly Ser Phe Val Ala Val Gly Val Ile Ser Met Ile Ala Ile Gln Val Met Ile Asn Ile Gly Val Val Thr Gly Leu Ile Pro Val Thr Gly Ile Thr Leu Pro Phe Leu Ser Tyr Gly Gly Ser Ser Leu

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Ser Arg Tyr

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90

85

Val Pro Asn Gln Ala Met Ser Val His Val Ser Asp Gly Leu Asp Val

80

					gac Asp											821
gga Gly	tac Tyr	gag Glu 110	gat Asp	gaa Glu	aac Asn	Gly 999	ccg Pro 115	aga Arg	atg Met	atc Ile	aat Asn	act Thr 120	cct Pro	tgg Trp	tat Tyr	869
					ttt Phe											917
					tcc Ser 145											965
					gcc Ala											1013
					aaa Lys											1061
		_		_	tat Tyr		_	_		_						1109
					gac Asp											1157
					gtt Val 225											1205
					gtc Val											1253
					tgg Trp			_								1301
					att Ile											1349
					ttt Phe											1397
					999 Gly 305											1445

tac ct Tyr Le															1493
gga aa Gly Ly															1541
acc ga Thr Gl		_		_		_	-	_							1589
ggc ta Gly Ty 36	r Gly	atc Ile	gca Ala	gct Ala	ccc Pro 370	gca Ala	tta Leu	acc Thr	gat Asp	atg Met 375	agc Ser	ctg Leu	gat Asp	gaa Glu	1637
ccg ga Pro Gl 380															1685
gtg gc Val Al															1733
gcg cc Ala Pr															1781
tta at Leu Me															1829
ata tt Ile Ph 44	e Gly														1877
aag ct Lys Le 460	_		_		_			_		_	_	_		_	1925
ctg ga Leu Gl															1973
tta ta Leu	aaagg	gaa q	ggcc۱	tctta	at ca	atac	gggag	g gto	cttt	ttt	atgo	cctga	aaa		2026
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<213> Bacillus licheniformis

<400> 187

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Val 225	Leu	Ser	Val	Leu	Arg 230	Glu	Ala	Leu	Tyr	Glu 235	Phe	Pro	Val	Leu	Glu 240
Val	Asn	Val	Asn	Leu 245	Pro	Ser	Trp	Val	Met 250	Val	Leu	Lys	Glu	Asn 255	His
Trp	Leu	Arg	Glu 260	Asn	Tyr	Gln	Asp	Ser 265	Val	Lys	Glu	Thr	Val 270	Lys	Asp
Ile	Lys	Arg 275	Leu	Arg	Asp	Val	Asp 280	Arg	Val	Val	Gly	His 285	Phe	Ser	Glu
Phe	Asp 290	Phe	Ile	Glu	Arg	Ala 295	Ser	Leu	Ala	Gly	Ile 300	Glu	Met	Gly	Gln
Gly 305	Ile	Ala	Glu	Ile	Asp 310	Leu	Tyr	Ala	Pro	Asp 315	Tyr	Leu	Tyr	Asp	Glu 320
Ile	Leu	Arg	Glu	Val 325	Val	Gly	Val	Glu	Ile 330	Arg	Gly	Lys	Asp	His 335	Leu
Leu	Gln	Leu	Met 340	Gln	Asp	Phe	Ala	His 345	Ala	Lys	Thr	Glu	Tyr 350	Asp	Gln
Val	Ser	Asp 355	Ala	Leu	Lys	Met	Val 360	Lys	Gln	Thr	Gly	Tyr 365	Gly	Ile	Ala
Ala	Pro 370	Ala	Leu	Thr	Asp	Met 375	Ser	Leu	Asp	Glu	Pro 380	Glu	Ile	Ile	Arg
Gln 385	Gly	Ser	Arg	Phe	Gly 390	Val	Arg	Leu	Lys	Ala 395	Val	Ala	Pro	Ser	Ile 400
His	Met	Ile	Lys	Val 405	Asp	Val	Glu	Ser	Glu 410	Phe	Ala	Pro	Ile	Ile 415	Gly
Thr	Glu	Lys	Gln 420	Ser	Glu	Glu	Leu	Val 425	Arg	Tyr	Leu	Met	Gln 430	Asp	Phe
Glu	Asp	Asp 435	Pro	Leu	Ser	Ile	Trp 440	Asn	Ser	Asp	Ile	Phe 445	Gly	Arg	Ser
Leu	Ser	Ser	Ile	Val	Arg	Glu	Gly	Ile	Gln	Ala	Lys	Leu	Ser	Leu	Met

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gcg t Ala S	cc Ser	gtc Val	caa Gln	agc Ser 80	ggc Gly	gct Ala	gaa Glu	cag Gln	ctg Leu 85	acg Thr	ctc Leu	ttt Phe	tta Leu	gcc Ala 90	gaa Glu	773
gaa g Glu A																821
gtc a Val I																869
gat t Asp S																917
ggg c Gly c 140																965
gaa g Glu G																1013
ttt g																1061
gag g Glu G																1109
agc t Ser S																1157
atg a Met I 220																1205
cag g Gln G																1253
ccg c																1301
cgg g Arg G						_				_						1349
att a Ile T																1397

aga Arg 300	gaa Glu	gaa Glu	aaa Lys	aga Arg	gag Glu 305	cgg Arg	gtc Val	tat Tyr	acc Thr	ctt Leu 310	tac Tyr	ctt Leu	gaa Glu	aac Asn	aaa Lys 315	1445
					gaa Glu											1493
					ttt Phe											1541
agc Ser	gga Gly	cga Arg 350	att Ile	tgg Trp	gaa Glu	aaa Lys	tcg Ser 355	att Ile	gaa Glu	agc Ser	gcc Ala	gat Asp 360	ttt Phe	ctg Leu	caa Gln	1589
atc Ile	cgc Arg 365	ctt Leu	gga Gly	acg Thr	gga Gly	aat Asn 370	gtt Val	gca Ala	tct Ser	tcg Ser	tac Tyr 375	caa Gln	atc Ile	aat Asn	ttg Leu	1637
					gcc Ala 385											1685
					gag Glu											1733
					gaa Glu											1781
					att Ile											1829
					ttg Leu											1877
tat Tyr 460	caa Gln	gaa Glu	tgg Trp	gaa Glu	tgg Trp 465	atg Met	aag Lys	tgg Trp	ctc Leu	ccg Pro 470	cat His	ttt Phe	cag Gln	atg Met	cct Pro 475	1925
					ggg Gly											1973
					tat Tyr											2021
					ttg Leu											2069
aat	cag	cag	ctc	atc	gca	gaa	cac	gtc	att	tta	gaa	tat	ttg	gaa	ggc	2117

Asn	Gln 525	Gln	Leu	Ile	Ala	Glu 530	His	Val	Ile	Leu	Glu 535	Tyr	Leu	Glu	Gly		
							tcg Ser									2	165
							cat His									2:	213
							aag Lys									2:	261
							agg Arg 595									2:	309
acg Thr	ctg Leu 605	aga Arg	acg Thr	ctt Leu	gac Asp	cac His 610	cag Gln	acg Thr	ggc Gly	atg Met	acg Thr 615	aat Asn	tcg Ser	att Ile	cct Pro	2	357
_		_	_			_	ctg Leu				_					2	405
							atg Met									2	453
							gga Gly									2	501
							ccc Pro 675									2	549
ggt Gly	tcg Ser 685	ggt Gly	aaa Lys	agt Ser	gaa Glu	ttt Phe 690	ttg Leu	cag Gln	act Thr	tat Tyr	att Ile 695	ttg Leu	tct Ser	ttg Leu	gca Ala	2	5 9 7
							gtc Val									2	645
gly aaa	ggc Gly	gga Gly	atg Met	gcg Ala 720	cag Gln	ccg Pro	ttc Phe	cgg Arg	aac Asn 725	att Ile	ccg Pro	cat His	ttg Leu	ctc Leu 730	gga Gly	2	693
							agc Ser									2	741
gcg Ala	tcc Ser	att Ile	aag Lys	agc Ser	gag Glu	ctg Leu	aag Lys	aaa Lys	agg Arg	cag Gln	cgg Arg	ctc Leu	ttt Phe	gat Asp	cag Gln	2	789

750 755 760

tac Tyr	aaa Lys 765	gtg Val	aac Asn	cat His	atc Ile	aac Asn 770	gac Asp	tat Tyr	aca Thr	aag Lys	ctt Leu 775	tac Tyr	aaa Lys	cag Gln	aaa Lys	2837
aaa Lys 780	gcg Ala	aaa Lys	acg Thr	gcg Ala	atg Met 785	ccg Pro	cac His	ctt Leu	ttc Phe	tta Leu 790	att Ile	tca Ser	gac Asp	gaa Glu	ttt Phe 795	2885
gcc Ala	gag Glu	ctg Leu	aaa Lys	agc Ser 800	gaa Glu	gaa Glu	ccg Pro	gaa Glu	ttt Phe 805	atc Ile	cgc Arg	gag Glu	ctt Leu	gtc Val 810	agt Ser	2933
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caa Gln	aaa Lys	ccg Pro 830	ggc Gly	ggc Gly	atc Ile	atc Ile	gat Asp 835	gac Asp	cag Gln	att Ile	tgg Trp	agc Ser 840	aac Asn	tcc Ser	aga Arg	3029
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ctc Leu 860	aaa Lys	aac Asn	ggg Gly	gat Asp	gcg Ala 865	gct Ala	acc Thr	atc Ile	acg Thr	gta Val 870	acg Thr	ggc Gly	cgc Arg	ggc Gly	tat Tyr 875	3125
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gcg Ala	atc Ile	gtc Val 910	aca Thr	gat Asp	acc Thr	gga Gly	tta Leu 915	att Ile	cct Pro	tta Leu	tca Ser	gat Asp 920	gtt Val	gat Asp	gct Ala	3269
gat Asp	cgc Arg 925	gct Ala	gcg Ala	aaa Lys	aaa Lys	gag Glu 930	gct Ala	gtg Val	acg Thr	gaa Glu	att Ile 935	tcg Ser	gca Ala	gtc Val	gtc Val	3317
gaa Glu 940	caa Gln	att Ile	gaa Glu	cgg Arg	att Ile 945	caa Gln	gcg Ala	gag Glu	atg Met	gga Gly 950	atc Ile	gag Glu	aag Lys	ctc Leu	ccg Pro 955	3365
					ccg Pro											3413
ccg Pro	tcg Ser	gag Glu	gaa Glu 975	gcc Ala	gat Asp	gcc Ala	ttt Phe	aac Asn 980	ttt Phe	gcc Ala	tat Tyr	atc Ile	gat Asp 985	gaa Glu	cct Pro	3461

gaa Glu	Lys (caa a Gln s 990	agc (Ser (cag (Gln (gag d Glu 1	Pro I	cc ag le Se 95	gc ta er Ty	ac co yr Ai	gc at rg Me	g ato	t G	aa ga lu As	ac ggo sp Gly	; /	3509
	atc Ile 1005					tcg Ser 1010										3554
	acg Thr 1020					agc Ser 1025							ccg Pro			3599
_	ttg Leu 1035					ttc Phe 1040							ctg Leu			3644
_	ctt Leu 1050					cac His 1055										3689
	acg Thr 1065					aaa Lys 1070							gcg Ala			3734
	gag Glu 1080					ctc Leu 1085										3779
	aag Lys 1095					ctg Leu 1100										3824
	ata Ile 1110					ttt Phe 1115										3869
	ctc Leu 1125					atc Ile 1130							cag Gln			3914
	gga Gly 1140					ctg Leu 1145										3959
		Ser				aac Asn 1160										4004
_	atg Met 1170	Asp				gca Ala 1175										4049
						cct Pro 1190										4094

	caa Gln 1200	tac Tyr	ttc Phe	gca Ala	caa Gln	atg Met 1205	ttt Phe	atg Met	cct Pro	gtg Val	gaa Glu 1210	gcg Ala	gac Asp	aac Asn	4139
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gca Ala	gaa Glu 1230	cgc Arg	tcg Ser	gaa Glu	ggc Gly	atg Met 1235	aga Arg	aag Lys	ccg Pro	gcg Ala	cct Pro 1240	gtg Val	ccg Pro	atg Met	4229
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ctt Leu	cag Gln 1260	cct Pro	gaa Glu	aga Arg	ggc Gly	ctt Leu 1265	att Ile	cca Pro	atg Met	gga Gly	ctc Leu 1270	gat Asp	gaa Glu	gaa Glu	4319
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atc Ile	atg Met 1305	ctc Leu	gag Glu	cac His	ctg Leu	ctt Leu 1310	gac Asp	cat His	gac Asp	acg Thr	aaa Lys 1315	aaa Lys	atc Ile	gcc Ala	4454
	ttt Phe 1320	gat Asp	tcg Ser	ata Ile	gac Asp	aga Arg 1325	Gly ggg	ctt Leu	tct Ser	caa Gln	tat Tyr 1330	gcg Ala	aca Thr	gag Glu	4499
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ctc Leu	gct Ala 1350	gag Glu	acg Thr	gaa Glu	gaa Glu	att Ile 1355	tgc Cys	cgg Arg	aca Thr	agg Arg	gaa Glu 1360	gcg Ala	atg Met	tat Tyr	4589
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ccg Pro	atg Met 1380	gtc Val	ttt Phe	att Ile	gtc Val	gac Asp 1385	gga Gly	att Ile	tca Ser	cgg Arg	ttc Phe 1390	cag Gln	cag Gln	acg Thr	4679
atc Ile	gac Asp 1395	gca Ala	tcg Ser	att Ile	cag Gln	gac Asp 1400	aaa Lys	atg Met	gcg Ala	atg Met	ttc Phe 1405	atg Met	aaa Lys	tct Ser	4724
tac	gcc	cat	tta	ggt	ttc	cac	ttt	ata	cct	gcc	gga	aat	cac	agc	4769

Tyr Ala His Leu Gly 1410	Phe His Phe 1415	e Ile Pro Ala	Gly Asn His 1420	Ser
gag ttc aca aaa ggc Glu Phe Thr Lys Gly 1425			gaa gtc aag Glu Val Lys 1435	
gtc aga cac gcg atg Val Arg His Ala Met 1440			gag cag aac Glu Gln Asn 1450	
att cag ctc cca tat Ile Gln Leu Pro Tyr 1455			att ctg ccg Ile Leu Pro 1465	
ttt ggc tat atc gtt Phe Gly Tyr Ile Val 1470		: aaa gag agg / Lys Glu Arg		
cct tta tgt gct gta Pro Leu Cys Ala Val 1485		g aaa gcg aaa B Lys Ala Lys	tgacggaaca	4992
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Leu Asp Asp Gln Asn Ser Arg Thr Leu Thr Ile Gly Pro Asp Leu Lys 20 25

His Ser Val Thr Ile Lys His Phe Ser Phe Glu Lys Gly Pro Val Thr Leu Glu Lys Gln Lys Asp Ser Asp Ala Leu Asn Val Gln Leu Gly Gly Glu Thr Val Ser Ser Leu Lys Leu Gly Gly Lys Ala Ser Val Gln Ser Gly Ala Glu Gln Leu Thr Leu Phe Leu Ala Glu Glu Ala Asp Ser Val Pro Ala Tyr Tyr Leu Gly Glu Arg Gln Glu Ile Val Ile Ser Ser Leu Asp Gln Glu Ala Asp Val Tyr Phe Asn Glu Thr Asp Ser Phe Phe Gly Glu Lys Gly Thr Phe Ser Phe Ile Arg Leu Asp Gly Gln Trp Asn Val Leu Pro Asn Asp Ala Lys Ile Tyr Leu Asn Gly Glu Glu Val Ser Ala Pro Val Ser Val Gln Asn Gly Asp Glu Ile Ala Phe Gly Leu Asn Ile Leu Arg Ile Val Glu Asp Asp Leu Leu Glu Ile Glu Gly Phe Gly Lys Phe Asp Thr Ser Leu Glu Asn Ile Leu Lys Pro Ser Ser Glu Thr Lys Asn Lys Tyr Pro Gln Tyr Arg Arg Pro Pro Arg Met Ile Tyr Asp Leu Pro Asp Glu Lys Val Ser Phe Ser Phe Pro Ala Gln Glu Ser Asp Gly Asp Asn Arg Gly Leu Trp Leu Met Ile Leu Pro Pro Leu Val Met Leu Ile Val Met Gly Ile Val Ala Leu Ile Gln Pro Arg Gly Ile Phe Ile 260 265 270

Ile	Val	Ser	Leu	Ala	Met	Phe	Met	Met	Thr	Leu	Ile	Thr	Ser	Thr	Val
		275					280					285			

- Gln Tyr Phe Arg Asp Lys Asn Gln Arg Lys Lys Arg Glu Glu Lys Arg 290 295 300
- Glu Arg Val Tyr Thr Leu Tyr Leu Glu Asn Lys Lys Glu Leu His 305 310 315 320
- Glu Leu Ala Glu Arg Gln Lys Phe Val Leu Asp Phe His Phe Pro Thr 325 330 335
- Phe Glu Arg Met Lys Tyr Leu Thr Lys Glu Ile Ser Gly Arg Ile Trp 340 345 350
- Glu Lys Ser Ile Glu Ser Ala Asp Phe Leu Gln Ile Arg Leu Gly Thr 355 360 365
- Gly Asn Val Ala Ser Ser Tyr Gln Ile Asn Leu Asn Gly Gly Asp Leu 370 380
- Ala Asn Arg Asp Thr Asp His Leu Leu Glu Gln Thr Gln Lys Met Glu 385 390 395 400
- Glu Val Tyr Arg Glu Leu Lys Asn Ala Pro Ile Thr Val Asn Leu Ala 405 410 415
- Glu Gly Pro Met Gly Val Val Gly Lys Leu Ser Val Val Lys Asn Glu
 420 425 430
- Ile His Gln Leu Val Gly Gln Leu Ala Phe Phe His Ser Tyr His Asp 435 440 445
- Leu Arg Phe Val Phe Ile Phe Asp Glu Ala Glu Tyr Gln Glu Trp Glu 450 455 460
- Trp Met Lys Trp Leu Pro His Phe Gln Met Pro His Ile Tyr Ala Lys 465 470 475 480
- Gly Phe Ile Tyr Asn Glu Gln Thr Arg Asp Gln Leu Leu Ser Ser Ile 485 490 495

Tyr	Glu	Ile	Leu 500	Arg	Glu	Arg	Asp	Leu 505	Asp	Glu	Asn	Lys	Lys 510	Lys	Thr
Leu	Phe	Lys 515	Pro	His	Phe	Val	Phe 520	Ile	Ile	Thr	Asn	Gln 525	Gln	Leu	Ile
Ala	Glu 530	His	Val	Ile	Leu	Glu 535	Tyr	Leu	Glu	Gly	Lys 540	Gln	Lys	His	Leu
Gly 545	Val	Ser	Thr	Ile	Val 550	Ala	Ala	Glu	Thr	Lys 555	Glu	Ser	Leu	Ser	Glu 560
Asn	Ile	His	Thr	Leu 565	Val	Arg	Tyr	Ile	Thr 570	Glu	Gln	Glu	Gly	Asp 575	Ile
Leu	Ile	Lys	Gln 580	Lys	Lys	Ala	Val	Gln 585	Ile	Pro	Phe	Gln	Leu 590	Asp	His
His	Asn	Arg 595	Glu	Asp	Asn	Glu	Gln 600	Phe	Ser	Arg	Thr	Leu 605	Arg	Thr	Leu
Asp	His 610	Gln	Thr	Gly	Met	Thr 615	Asn	Ser	Ile	Pro	Asp 620	Thr	Val	Ser	Phe
Leu 625	Glu	Leu	Phe	Gln	Val 630	Lys	Glu	Val	Asp	Asp 635	Ile	Gly	Ile	Glu	Gln 640
Lys	Trp	Met	Thr	Ser 645	Glu	Ser	Ala	Lys	Ser 650	Leu	Ala	Val	Pro	Ile 655	Gly
Tyr	Lys	Gly	Lys 660	Asp	Asp	Ile	Val	Tyr 665	Leu	Asn	Leu	His	Glu 670	Lys	Ala
His	Gly	Pro 675	His	Gly	Leu	Leu	Ala 680	Gly	Thr	Thr	Gly	Ser 685	Gly	Lys	Ser
Glu	Phe 690	Leu	Gln	Thr	Tyr	Ile 695	Leu	Ser	Leu	Ala	Val 700	His	Phe	His	Pro
His 705	Glu	Val	Ala	Phe	Leu 710	Leu	Ile	Asp	Tyr	Lys 715	Gly	Gly	Gly	Met	Ala 720

Gln Pro Phe Arg Asn Ile Pro His Leu Leu Gly Thr Ile Thr Asn Ile Glu Gly Ser Lys Asn Phe Ser Asn Arg Ala Leu Ala Ser Ile Lys Ser Glu Leu Lys Lys Arg Gln Arg Leu Phe Asp Gln Tyr Lys Val Asn His Ile Asn Asp Tyr Thr Lys Leu Tyr Lys Gln Lys Lys Ala Lys Thr Ala Met Pro His Leu Phe Leu Ile Ser Asp Glu Phe Ala Glu Leu Lys Ser Glu Glu Pro Glu Phe Ile Arg Glu Leu Val Ser Ala Ala Arg Ile Gly Arg Ser Leu Gly Val His Leu Ile Leu Ala Thr Gln Lys Pro Gly Gly Ile Ile Asp Asp Gln Ile Trp Ser Asn Ser Arg Phe Lys Val Ala Leu Lys Val Gln Asp Ala Asn Asp Ser Lys Glu Ile Leu Lys Asn Gly Asp Ala Ala Thr Ile Thr Val Thr Gly Arg Gly Tyr Leu Gln Val Gly Asn Asn Glu Val Tyr Glu Leu Phe Gln Ser Ala Trp Ser Gly Ala Pro Tyr Met Glu Asp Gly Tyr Gly Thr Glu Asp Glu Val Ala Ile Val Thr Asp Thr Gly Leu Ile Pro Leu Ser Asp Val Asp Ala Asp Arg Ala Ala Lys Lys Glu Ala Val Thr Glu Ile Ser Ala Val Val Glu Gln Ile Glu Arg

- Ile Gln Ala Glu Met Gly Ile Glu Lys Leu Pro Ser Pro Trp Leu Pro 945 950 955 960
- Pro Leu Glu Glu Arg Ile Pro Lys Thr Arg Tyr Pro Ser Glu Glu Ala 965 970 975
- Asp Ala Phe Asn Phe Ala Tyr Ile Asp Glu Pro Glu Lys Gln Ser Gln 980 985 990
- Glu Pro Ile Ser Tyr Arg Met Met Glu Asp Gly Asn Ile Gly Ile Val 995 1000 1005
- Gly Ser Ser Gly Tyr Gly Lys Ser Leu Thr Ala Thr Thr Phe Met 1010 1015 1020
- Met Ser Phe Ala Glu Gln Tyr Thr Pro Glu Glu Leu His Tyr Tyr 1025 1030 1035
- Ile Phe Asp Phe Gly Asn Gly Thr Leu Leu Pro Leu Ala Arg Leu 1040 1045 1050
- Pro His Thr Ala Asp Tyr Phe Leu Met Asp Gln Thr Arg Lys Ile 1055 1060 1065
- Glu Lys Phe Met Val Arg Ile Lys Ala Glu Ile Glu His Arg Lys 1070 1075 1080
- Asn Leu Phe Arg Ala Lys Glu Ile Ser His Ile Lys Met Tyr Asn 1085 1090 1095
- Ala Leu Asn Glu Glu Lys Leu Pro Phe Ile Phe Ile Thr Val Asp 1100 1105 1110
- Asn Phe Asp Ile Ile Lys Asp Glu Met His Glu Leu Glu Ser Glu 1115 1120 1125
- Phe Ile Gln Phe Ser Arg Asp Gly Gln Ser Leu Gly Ile Tyr Leu 1130 1135 1140
- Ile Leu Thr Ala Thr Arg Val Asn Ala Ile Arg Gln Ser Leu Leu 1145 1150 1155
- Asn Asn Leu Lys Thr Arg Val Val His Tyr Leu Met Asp Gln Ser

1160	1165	1170

Glu Ala Tyr Ser Ile Ile Gly Arg Pro Glu Phe Ser Leu Glu Pro

Ile Pro Gly Arg Val Ile Ile Asn Lys Glu Asn Gln Tyr Phe Ala

116	1190	Oly	arg	VUI	110	1195	71011	Lys	Olu		1200	-1-		
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Glu	Gly 1220	Ile	Lys	Ala	Asp	Ile 1225	Gln	Ala	Ile	Ala	Glu 1230	Arg	Ser	Glu
Gly	Met 1235	Arg	Lys	Pro	Ala	Pro 1240	Val	Pro	Met	Leu	Pro 1245	Leu	Glu	Leu
Ser	Val 1250	Thr	Gln	Phe	Val	Arg 1255	Asp	Tyr	Pro	Leu	Gln 1260	Pro	Glu	Arg
Gly	Leu 1265		Pro	Met	_	Leu 1270	_	Glu	Glu	Thr	Val 1275	Glu	Pro	Val
Tyr	Phe 1280	Asn	Leu	Glu	Lys	Asn 1285	Lys	His	Cys	Leu	Ile 1290	Met	Gly	Gln
Thr	Gln 1295	Arg	Gly	Lys	Thr	Asn 1300	Val	Ile	Lys	Ile	Met 1305	Leu	Glu	His
Leu	Leu 1310	Asp	His	Asp	Thr	Lys 1315	Lys	Ile	Ala	Val	Phe 1320	Asp	Ser	Ile
Asp	Arg 1325	Gly	Leu	Ser	Gln	Tyr 1330	Ala	Thr	Glu	Asp	Gln 1335	Ile	Ser	Tyr
Leu	Glu 1340	Thr	Lys	Asp	Asp	Ile 1345	Leu	Leu	Trp	Leu	Ala 1350	Glu	Thr	Glu
Glu	Ile 1355	Cys	Arg	Thr	Arg	Glu 1360	Ala	Met	Tyr	Leu	Glu 1365	Ala	Val	Lys
Gln	Gly 1370	Glu	Ile	Ala	Asn	Leu 1375	Asp	Phe	Ser	Pro	Met 1380	Val	Phe	Ile
									351					

1390 1385 Gln Asp Lys Met Ala Met Phe Met Lys Ser Tyr Ala His Leu Gly 1400 1405 Phe His Phe Ile Pro Ala Gly Asn His Ser Glu Phe Thr Lys Gly 1415 1420 Tyr Asp Ser Leu Thr Ser Glu Val Lys Gln Val Arg His Ala Met 1430 1435 Leu Leu Met Lys Lys Ser Glu Gln Asn Leu Ile Gln Leu Pro Tyr 1450 1455 1445 Glu Arg Gln Glu Pro Glu Ile Leu Pro Gly Phe Gly Tyr Ile Val 1470 1460 1465 Glu Asn Gly Lys Glu Arg Lys Ile Gln Ile Pro Leu Cys Ala Val 1485 1475 1480 Glu Arg Lys Lys Ala Lys 1490 <210> 190 <211> 3343 <212> DNA <213> Bacillus licheniformis <220> <221> CDS <222> (501)..(2843) <400> 190 tgtattcaaa aaacaattta acccgtgaca tcgagacgaa tgtcatagga aaaaatgcgg 60 ttaaatacgg attaatcgat gaaaaccggc gagagacaga caggcgattc aaaagctgat 120 gaatataatc gaacaaaaca aggacgcaca ggaagggata atccaatgat tctgtatacg 180 aaaatgccgc aggaaatcgt gttcgcaggg caggcggaaa actcgaaatt aaaacagatc 240 qatqtaaaca qcqtqccact tttaqtcqaq atgaacggag aggaagcaag ggacgttcag 300 gttctcagca cgaacccgat ggatttttta aaacaagaaa cggcccctgg gcagacgctt 360

Val Asp Gly Ile Ser Arg Phe Gln Gln Thr Ile Asp Ala Ser Ile

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acgcagtaag gtgatggaac atg gca aaa aga aaa cga aaa tca aca aag aaa Met Ala Lys Arg Lys Arg Lys Ser Thr Lys Lys 1 5 10	533
caa aaa caa gga aaa aaa cgg atc cat ctt aaa ttt gaa ttg tac gga Gln Lys Gln Gly Lys Lys Arg Ile His Leu Lys Phe Glu Leu Tyr Gly 15 20 25	581
tta atc tgt atc gcc atc tcg att att gcg gtt ttg cag ctt ggc gta Leu Ile Cys Ile Ala Ile Ser Ile Ile Ala Val Leu Gln Leu Gly Val 30 35 40	629
gca ggg caa acg ttc att tac atg ttc cgc ttt ttc gcc ggt gaa tgg Ala Gly Gln Thr Phe Ile Tyr Met Phe Arg Phe Phe Ala Gly Glu Trp 45 50 55	677
ttc atc ctt tgc ctt ctc ggc ctc ttt tta acg ggc ttg tct tta ttt Phe Ile Leu Cys Leu Leu Gly Leu Phe Leu Thr Gly Leu Ser Leu Phe 60 65 70 75	725
tgg aaa aag aaa aca ccc agt ttt ttg acg agg aga aaa gcg ggc ctt Trp Lys Lys Lys Thr Pro Ser Phe Leu Thr Arg Arg Lys Ala Gly Leu 80 85 90	773
tac tgc atc att gca agc atg ctg ctt ctt tca cat gtc cag ctg ttt Tyr Cys Ile Ile Ala Ser Met Leu Leu Leu Ser His Val Gln Leu Phe 95 100 105	821
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aat acg tgg gag ctg ttt ctg atg gat gta aaa ggc gag aca gga tcg Asn Thr Trp Glu Leu Phe Leu Met Asp Val Lys Gly Glu Thr Gly Ser 125 130 135	917
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ctg atc aaa tgg atg acc ccg gtc gcc tcc ttc atg aaa aac cag tgg Leu Ile Lys Trp Met Thr Pro Val Ala Ser Phe Met Lys Asn Gln Trp 190 195 200	1109
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Gln	Ala 205	Phe	Leu	Ala	Asp	Leu 210	Lys	Gln	Leu	Lys	Asn 215	Ser	Ser	Pro	Lys		
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gaa Glu	gag Glu	cct Pro	gta Val	caa Gln 240	gaa Glu	gcg Ala	gac Asp	ctt Leu	gat Asp 245	cca Pro	gat Asp	ccg Pro	gtt Val	att Ile 250	caa Gln	-	1253
						agc Ser										:	1301
gtt Val	caa Gln	gct Ala 270	tac Tyr	gaa Glu	gct Ala	ccg Pro	gcg Ala 275	gct Ala	cct Pro	gct Ala	gaa Glu	cct Pro 280	cct Pro	gct Ala	gag Glu	:	1349
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agt Ser 380	gac Asp	gac Asp	ttg Leu	gct Ala	tta Leu 385	gcg Ala	ctc Leu	gcg Ala	gcc Ala	aag Lys 390	gat Asp	atc Ile	cgc Arg	atc Ile	gaa Glu 395		1685
gcc Ala	ccg Pro	atc Ile	ccc Pro	gga Gly 400	aaa Lys	tcg Ser	gcg Ala	att Ile	gga Gly 405	atc Ile	gaa Glu	gtg Val	ccg Pro	aat Asn 410	gcg Ala		1733
gaa Glu	gtg Val	gcg Ala	atg Met 415	gtt Val	tcc Ser	ttg Leu	aaa Lys	gaa Glu 420	gtg Val	ctt Leu	gaa Glu	tcg Ser	aaa Lys 425	ctg Leu	aat Asn		1781
gac Asp	cgg Arg	ccg Pro	gat Asp	gca Ala	aag Lys	ctg Leu	atg Met	atc Ile	ggc Gly	ctc Leu	ggc Gly	cgg Arg	aac Asn	att Ile	tcc Ser		1829

430 435 440

						gag Glu 450										1877
gca Ala 460	gga Gly	gcg Ala	acc Thr	gga Gly	agc Ser 465	gly ggg	aaa Lys	agc Ser	gtc Val	tgt Cys 470	gtc Val	aac Asn	ggg Gly	atc Ile	att Ile 475	1925
aca Thr	agc Ser	att Ile	ttg Leu	atg Met 480	agg Arg	gca Ala	aag Lys	ccc Pro	cac His 485	gaa Glu	gtg Val	aag Lys	atg Met	atg Met 490	atg Met	1973
						gag Glu										2021
						aca Thr										2069
						atg Met 530										2117
						gaa Glu										2165
						aag Lys										2213
						gac Asp										2261
_	_	_				ctt Leu	-									2309
						cag Gln 610										2357
						ccg Pro										2405
						att										2453
GIn	Thr	Asp	ser	Arg 640	IIII	116	пси		645	1	2			650		

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gtc gat cac gtc atc agc cag caa aaa gcc caa tac caa gaa gaa atg Val Asp His Val Ile Ser Gln Gln Lys Ala Gln Tyr Gln Glu Glu Met 685 690 695	2597
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tat gac gaa gcg gtc gca ctt gtg gtc agc atg cag acg gct tct gta Tyr Asp Glu Ala Val Ala Leu Val Val Ser Met Gln Thr Ala Ser Val 720 725 730	2693
tcc atg ctg caa agg aga ttc cgc atc ggc tat aca aga gcg gcg cgg Ser Met Leu Gln Arg Arg Phe Arg Ile Gly Tyr Thr Arg Ala Ala Arg 735 740 745	2741
ctt atc gat gcc atg gaa gag cgg gga atc gtc ggc cca tat gaa gga Leu Ile Asp Ala Met Glu Glu Arg Gly Ile Val Gly Pro Tyr Glu Gly 750 755 760	2789
tca aaa ccc cgt gaa gtt ctc ttg tca aaa gag caa tac gaa gaa ctc Ser Lys Pro Arg Glu Val Leu Leu Ser Lys Glu Gln Tyr Glu Glu Leu 765 770 775	2837
tct tct tgagaagaga gttcttgttt aacataattt cattatgtaa actaaaaaac Ser Ser 780	2893
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<212> PRT

<213> Bacillus licheniformis

<400> 191

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Glu	Ala	Asp	Leu	Asp	Pro	Asp	Pro	Val	Ile	Gln	Ser	Glu	Pro	Ile	Ile
		_		245					250					255	

- Ser Ser Phe Ser Asp Arg Asp Glu Lys Pro Glu Val Gln Ala Tyr Glu 260 265 270
- Ala Pro Ala Ala Pro Ala Glu Pro Pro Ala Glu Pro Glu Ile Gly Glu 275 280 285
- Glu Met Gln Ala Ser Gly Ala Pro Glu Ile Thr Phe Thr Glu Leu Glu 290 295 300
- Asn Lys Asp Tyr Gln Leu Pro Ser Ile Gln Leu Leu Asp Asp Pro Lys 305 310 315
- His Thr Gly Gln Gln Ala Asp Lys Lys Asn Ile Tyr Asp Asn Ala Arg 325 330 335
- Lys Leu Glu Arg Thr Phe Gln Ser Phe Gly Val Lys Ala Lys Val Thr 340 345 350
- Gln Val His Leu Gly Pro Ala Val Thr Lys Tyr Glu Val Tyr Pro Asp 355 360 365
- Val Gly Val Lys Val Ser Lys Ile Val Asn Leu Ser Asp Asp Leu Ala 370 380
- Leu Ala Leu Ala Ala Lys Asp Ile Arg Ile Glu Ala Pro Ile Pro Gly 385 390 395 400
- Lys Ser Ala Ile Gly Ile Glu Val Pro Asn Ala Glu Val Ala Met Val 405 410 415
- Ser Leu Lys Glu Val Leu Glu Ser Lys Leu Asn Asp Arg Pro Asp Ala 420 425 430
- Lys Leu Met Ile Gly Leu Gly Arg Asn Ile Ser Gly Glu Ala Val Leu 435 440 445
- Ala Glu Leu Asn Lys Met Pro His Leu Leu Val Ala Gly Ala Thr Gly 450 455 460

Ser 465	Gly	Lys	Ser	Val	Cys 470	Val	Asn	Gly	Ile	11e 475	Thr	Ser	Ile	Leu	Met 480
Arg	Ala	Lys	Pro	His 485	Glu	Val	Lys	Met	Met 490	Met	Ile	Asp	Pro	Lys 495	Met
Val	Glu	Leu	Asn 500	Val	Tyr	Asn	Gly	Ile 505	Pro	His	Leu	Leu	Ala 510	Pro	Val
Val	Thr	Asp 515	Pro	Lys	Lys	Ala	Ser 520	Gln	Ala	Leu	Lys	Lys 525	Val	Val	Asn
Glu	Met 530	Glu	Arg	Arg	Tyr	Glu 535	Leu	Phe	Ser	His	Thr 540	Gly	Thr	Arg	Asn
Ile 545	Glu	Gly	Tyr	Asn	Asp 550	Tyr	Ile	Lys	Arg	Met 555	Asn	Ala	Ala	Glu	Glu 560
Ala	Lys	Gln	Pro	Glu 565	Leu	Pro	Tyr	Ile	Ile 570	Val	Ile	Val	Asp	Glu 575	Leu
Ala	Asp	Leu	Met 580	Met	Val	Ala	Ser	Ser 585	Asp	Val	Glu	Asp	Ser 590	Ile	Thr
Arg	Leu	Ser 595	Gln	Met	Ala	Arg	Ala 600	Ala	Gly	Ile	His	Leu 605	Ile	Ile	Ala
Thr	Gln 610	Arg	Pro	Ser	Val	Asp 615	Val	Ile	Thr	Gly	Val 620	Ile	Lys	Ala	Asn
Ile 625	Pro	Ser	Arg	Ile	Ala 630	Phe	Ser	Val	Ser	Ser 635	Gln	Thr	Asp	Ser	Arg 640
Thr	Ile	Leu	Asp	Met 645	Gly	Gly	Ala	Glu	Lys 650	Leu	Leu	Gly	Arg	Gly 655	Asp
Met	Leu	Phe	Leu 660	Pro	Val	Gly	Ala	Asn 665	Lys	Pro	Leu	Arg	Val 670	Gln	Gly
Ala	Phe	Leu 675	Ser	Asp	Glu	Glu	Val 680	Glu	Lys	Val	Val	Asp 685	His	Val	Ile

- Ser Gln Gln Lys Ala Gln Tyr Gln Glu Glu Met Ile Pro Glu Glu Thr 690 695 700
- Gln Glu Thr Val Ser Glu Val Thr Asp Asp Leu Tyr Asp Glu Ala Val 705 710 715 720
- Ala Leu Val Val Ser Met Gln Thr Ala Ser Val Ser Met Leu Gln Arg
 725 730 735
- Arg Phe Arg Ile Gly Tyr Thr Arg Ala Ala Arg Leu Ile Asp Ala Met 740 745 750
- Glu Glu Arg Gly Ile Val Gly Pro Tyr Glu Gly Ser Lys Pro Arg Glu 755 760 765
- Val Leu Leu Ser Lys Glu Gln Tyr Glu Glu Leu Ser Ser 770 775 780